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Martin, Charles Carroll

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Export packing

Place:
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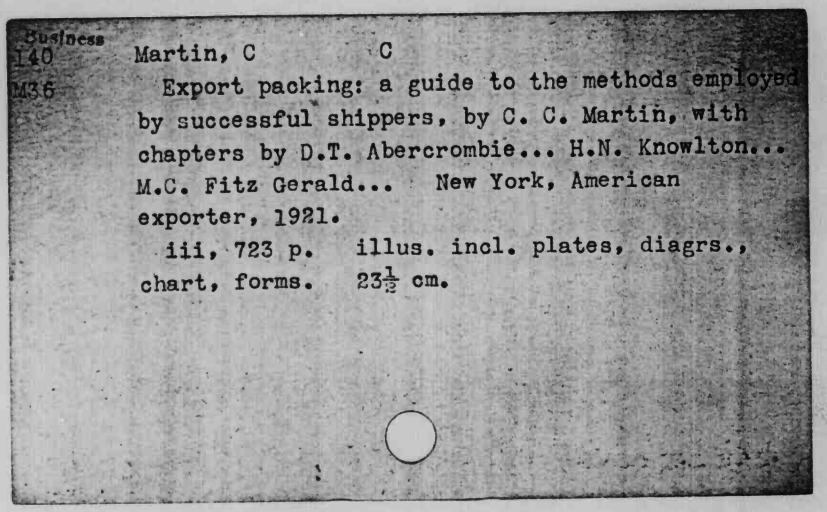
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Export packing: a guide to the methods employed by successful shippers, by C. C. Martin, with chapters by D.T. Abercrombie... H.N. Knowlton... M.C. Fitz Gerald... New York, American exporter, 1921.
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Cargo being loaded in a U. S. port.

EXPORT PACKING

A Guide to the Methods Employed by Successful Shippers

By C. C. MARTIN

WITH CHAPTERS BY

D. T. ABERCROMBIE, FORMERLY LT.-COL. QUARTERMASTER CORPS, U. S. ARMY;
H. N. KNOWLTON, FORMERLY CAPTAIN ORDNANCE DEPARTMENT,
U. S. ARMY; M. C. FITZ GERALD, MANAGER OF TRANSPORTATION, GENERAL ELECTRIC COMPANY

AMERICAN EXPORTER
THE JOHNSTON EXPORT PUBLISHING CO.
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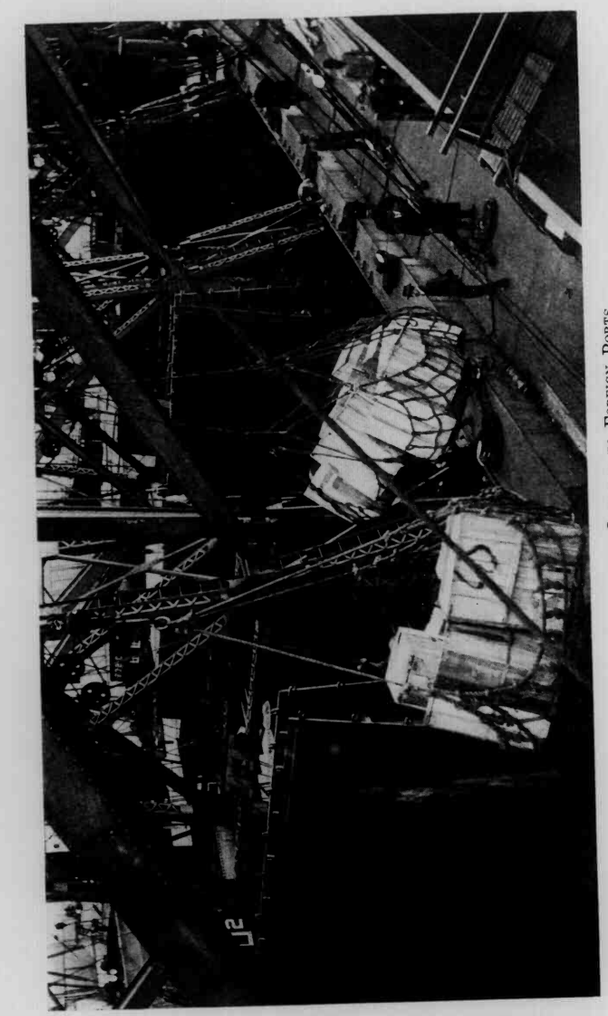

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TO
HARRISON C. LEWIS
WITH
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PREFACE

THE plan has been consistently followed throughout this book of having the men who are practically and intimately in touch with packing problems tell the story, whether these men be of national, even international reputation, such as Lieut. Colonel David T. Abercrombie, Mr. M. C. Fitz Gerald or Captain H. N. Knowlton, who have contributed special chapters, or whether they be those who are daily in touch with the problem in the great and small manufacturing establishments throughout the land. To a large extent my own work has been restricted to that of editor and has consisted in arranging and assembling the material at hand, and I am convinced that any book on packing to be of value must necessarily be written in this way.

My thanks therefore are not alone due to the gentlemen who have been good enough to contribute signed chapters to this volume, and who have done so, let it be said, in a spirit of generous desire to assist foreign trade; my obligation is equally great to those public spirited men and organizations who have placed freely at my disposal not alone a wealth of photographic material, but have also given me the benefit of their best critical judgment both in reference to the packing problem in general and to their own individual work in particular.

There is a great deal of material that might have been included in this volume which I have been compelled to omit because of mere physical limitations, for it would not have been at all difficult to have collected sufficient data to make two books of this size. However, such additional material would have been in certain instances a repetition of what we have, and I do not believe that any essential phase of the problem has been omitted. At the same time in addition to the experimental and

other work mentioned here, recognition should be given of the developments that are taking place through the efforts of such organizations as the National Canners' Association, the National Association of Egg Case and Egg Case Filler Manufacturers, the National Association of Box Manufacturers, the Mellon Institute of Industrial Research of the University of Pittsburgh, the Glass Container Association of America, the American Society for Testing Materials, The Container Club and other groups. In a number of cases, however, the investigations have to do purely with containers for domestic shipment, with which this volume does not concern itself, while inclusion of more matter referring to export would have made this book exceed all reasonable bounds.

Attention should be called to the fact that in a number of instances the exigencies of good bookmaking as well as the number of photographs in relation to the quantity of text, have made it impossible to place photographs facing corresponding descriptive text matter. This is notably the case with the photographs illustrating Mr. Fitz Gerald's article, and it has been further necessary to place a number of these photographs toward the front of the book. However, as page references appear in all cases it is not believed that this is a material consideration.

C. C. MARTIN.

New York, December 1, 1920.

EXPORT PACKING

CHAPTER I

THE PROBLEM

THERE are a good many of our exporters, unfortunately too many, who are inclined to look upon the problems of export packing in that smug fashion which reduces them to the position of no problems at all. Indeed it seems to be a habit nowadays to consider the export packing situation as something that has been well solved, leaving us free to move along to the discussion of more pressing and more profitable subjects. Export packing, in other words, sometimes seems to be regarded as a difficulty that no longer exists and one that no longer requires study or consideration.

The statement in the foregoing paragraph is not an exaggeration. To mention export packing to a large, and, it seems, constantly increasing number of exporters, is to mention a subject that has been worn threadbare; that belongs to the kindergarten of exporting, and that should give way to more constructive and fundamental problems. However, without in any way attempting to be radical or even original, I believe that export packing is one of the most fundamental of export problems. It may even be put in a category with export banking and export selling in point of importance.

Why There is a Problem.—It is true that the man in some other part of the world than our own is interested in terms of credits. He is interested in the quality of goods, conditions of delivery and the many other factors that go to make good service and good exporting. But it appears that in a sense all of these things rest on the character of the export package. The foregoing factors

lose their importance and value if the goods received are not received in good shape. A machine may be *the* marvelous machine; it may effect economies of all sorts; it may be just the machine indicated in the particular case. But if it arrives broken; if it is necessary to wait months for new parts, much of the good will of the customer is going to be lost. However, this is merely one phase of the packing situation; for packing must not only be good packing, it must be economical packing; it must conform to the peculiar custom-house conditions; it must be adapted to a wide variety of special factors which are too frequently either ignored or unknown on the part of many of the export fraternity.

Purpose of this Book.—The purpose of this book is not to solve all the problems of export packing. That would not be a purpose; it would be a presumption. The purpose is to discuss the fundamental principles of export packing; to suggest certain rules which if observed will produce the proper export package, and to present a sufficient number of concrete examples to serve as guides both in the administrative office and in the actual packing shop.

The writer does not mean here to suggest that our export packing in general is bad. He does not mean to suggest that a large percentage of it is bad. American export packing is generally good, although much of it is not the packing produced either by the English, French or Belgians, and I do believe that in a good many instances our export packing could be greatly improved.

Evidence from New York.—For the curious in this matter a trip around the docks of New York is illuminating. Not so long ago the writer saw two large export packages being hauled along Fulton Street, the destination marks showing Amsterdam. These cases were about 4 x 5 x 4 feet in size and weighed approximately 800 kilos each. The wood used was three-quarter inch stuff and there was no strapping of any description on either case. One of the boards on the top of one of the cases had loosened even before being put aboard ship, and was flapping from side to side with the movement of the truck. We can well imagine how these goods reached Amsterdam, even if re-coopered before loading on steamer, and we may also believe that the manufacturer of these goods thought he was providing an adequate case. At least it may be assumed that he did. But whatever the belief on the part of the manufacturer, the fact is that he was not fair to his customer, he was not fair to himself, and most important of all he was not fair to that national prestige which it should be the aim and desire of every exporter to foment and develop.

A New Spirit Abroad.—Fortunately, there is a new spirit abroad in this question of export packing. Today the man who is considering constructive export work is also considering constructive export packing. The late war had much to do with this new viewpoint. The problem of the government in its overseas work was not only colossal, it was also one of extreme urgency. On one side we had millions of fighting men who had to be fed and clothed and provisioned in the smallest possible space of time. On the other we had a vast quantity of goods to be shipped in a relatively small number of vessels. This condition developed remarkable skill and resource in designing and constructing the export package; and it concentrated attention on packing, as such, as had never been the case before. The result was that really remarkable things were done, not only in the sense of adequate packing, but also in that of economical packing.

With this as a start, packing research as an integral part of export technique is rapidly being developed. The men in control of new combinations of capital or products see that the transportation of goods is as important as the production of goods. Space saved is money saved; goods that arrive in the same shape as they left the factory are an extremely valuable business asset.

This new development is one of the most encouraging signs of the times in exporting. It promises to remove a very large and important obstacle to the progress of export trade. It is to be hoped that by the very force

of competition it will also lead certain very well satisfied manufacturers and exporters to mend their ways, and that it will force them to send packages abroad that are a credit both to the contents of the packages and to the country of origin.

The Export Problem is Special.—The experience a shipper has gained in packing for the domestic market will not always serve him in the foreign field. At home we are dealing with conditions of astonishing simplicity compared to those abroad. Indeed a man who is working for foreign trade should, in a measure, wipe off his domestic experience slate. What are some of the considerations that should enter into the equation?

Let Us Follow the Goods.—Let us take one portion of the world, for example, the Argentine. If I had a first order to be shipped to the Argentine and it was my intention to go into the export business seriously, I should do a great many things before I let that first shipment be packed. I should get first of all a good atlas and I would see where this country of the Argentine is located. I would make inquiries and determine just what route or routes these goods of mine, that bore my name or my factory imprint, were going to take. I should consider carefully the name of the city in which the consignee lived. Is it a port, or is it a point in the interior? If a port, how are the goods taken off the ship? Are they landed directly on the dock or are they transhipped by lighter? If an interior point, how do my goods get to this interior point? Are they shipped and handled by modern methods, over modern railroads, or are they transported over mountains and along rivers through primitive countries by primitive men, with only the simplest means for transporting available? I would give considerable study to this question, and only after I had thoroughly informed myself would I proceed to take up another point. This second point might well be the climatic conditions to which my goods would be exposed. I know fairly well domestic conditions, but what I need to do is to discover what these conditions are abroad.

And so I watch these goods in fancy as they are loaded on the boat in New York, and I see them pass down the Atlantic on their long voyage to the Argentine. I consult books and obtain information, and I learn that my goods pass through the tropics; that they may be stowed close to boilers; and that consequently they should be protected against heat, in case they are sensitive to this influence. Likewise my goods must be protected against moisture, for the holds of vessels are none too dry, and an open hatch may let in a good portion of ocean brine.

Special Instructions.—On this first order I receive, I notice that the specification of the packing of the goods is different, in its arrangement, from that I am accustomed to follow for my domestic trade. I am also told in this order to limit the size and weight of the package and to specify the gross, tare and net weight in kilos. I am also given certain instructions with reference to invoices and other papers. This is novel, but after careful investigation I find that every one of the instructions has an intimate relation to the conditions in the Argentine, and that if I fail to follow any one of them it will mean loss of money or inconvenience to my client.

This is a simple statement of a situation which confronts every exporter during each working day. The writer does not wish to convey the impression that export business is beset with difficulties that more than balance the advantages of export trade. But what he does wish to urge is that export business is a special business which should be treated conscientiously. We have at the present time the greatest opportunity that has ever been presented any nation. With little or no effort on our part unavoidable necessity has brought the world to our doors, and by proper conduct we can develop and maintain a great export business that will be of vast importance in the future history of our country. But at the present time we are being tried and we are most certainly being tested. Let us hope that the good behavior continues that is noticeable in certain quarters.

The New Viewpoint in Trade.—During the last few years there has taken place a radical change in the viewpoint of the average manufacturer and merchant. It is no longer a question of merely selling goods; it is principally important to keep the goods sold, once they are sold, and to sell more goods. The predatory merchant or manufacturer is rapidly passing away. Into his room there is stepping the man who builds his organization on service, and this word in its broad and, let it be said, modern acceptation, is the foundation of modern business.

In this connection I cannot do better than quote a portion of the admirable monthly bulletin, published by The National City Bank of New York, and written by Mr. George E. Roberts. In the issue of February, 1919, Mr. Roberts cogently remarks:

"No investment is worth anything, or can have standing in any financial market, unless it is based upon a value arising from public service. It must be shown to meet a social need in a manner that will secure at least a share of the popular patronage, and every new business is expected to justify itself by showing that it can render a new or superior service. Old investments lose their value if new ones render better service, and there is the familiar spectacle of long-established business houses passing into decay and oblivion because unable to keep up in service with younger houses in the field. The study of every business organization and every individual entitled to any position in the business world is how to improve the service it is rendering to the public. Any man who has a new idea of practical usefulness to the public has a career assured. Emerson said that if any man could make a mouse-trap better than all others the world would make a beaten track to his door."

Export Packing is Export Service.—Good export packing is nothing more than an extension of service, and as Mr. Roberts points out, the house that gives the best service is the one which will succeed. For proper packing means nothing more than conscientious consideration

of the interests of the ultimate customer, with an equal admixture of consideration for the interests of the manufacturer who is trying to win the good-will and the trade of this ultimate customer. There are too many shippers whose effort seems to be to spend as little money and time as possible on the packing of their goods, while in point of fact they should try to see how much money and time they can profitably spend on the protecting envelope of the goods in question. There can be no doubt that a vast amount of valuable export business is lost by careless packing, a condition which at once convinces the customer that the shipper either is not interested in the goods, or has not taken to heart in the least the interests of the purchaser.

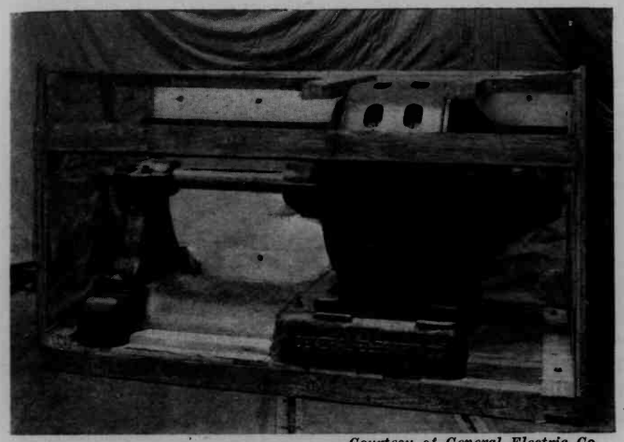
A Common Impression.—As far as possible the writer wishes to avoid in this book any suggestion of unmerited criticism, but throughout the world there seems to be an impression that the American manufacturer is always willing to take an order, but that he does not concern himself unduly as to when he is going to ship the goods or as to the condition in which they are going to arrive at their ultimate destination. To offset this impression the first consideration on receiving an order from abroad, and after its due acceptance, should be to appreciate the fact that a man thousands of miles away has placed in our hands a trust of no inconsiderable magnitude, and that we should faithfully and honestly fulfill that trust. We should see that the goods arrive as quickly as possible at the foreign port, and above all should we see that when they do arrive they may at once be put on sale or in use, as the case may be. It should be a point of honor with every shipper to work for the benefit and business convenience of the foreign client.

Cheap Packing is False Economy.—To-day the American market is flooded with all sorts of packing devices which in too many cases commend themselves solely because of their cheapness. Cheap packing has never yet proved anything but a false economy. The foreign manufacturer, in general, has apparently adopted as a prin-

ciple that of making his package as good as his product, while in the effort to constantly lower costs the American does not neglect to take a slice off his packing. But it should never be lost sight of that the foreign buyer is not interested in this false economy, for he will not hesitate to pay for good packing. The writer has known instances in which this has been insisted on because of lack of confidence in the ordinary packing of the average manufacturer. When a foreign house gives special instructions in reference to packing, it is not caprice nor any rare geometrical or artistic sense that originates these instructions. The importer knows what the conditions in his country are, and his packing instructions are gauged entirely by these conditions. Every set of instructions for the packing of export goods should be followed by the manufacturer absolutely to the letter; and if the instructions are not given, it is the duty of our exporters to inform themselves of the conditions at the foreign point and adapt the packing to those conditions.

The Export Packing Triangle.—The export packing problem is frequently complicated by virtue of the fact that the manufacturer does not always pack his own goods for export. This condition usually arises when the manufacturer has his goods packed at seaboard by a house making a specialty of this business, or when the manufacturer is not the actual consignor of the goods. In the first instance, the decision to have the goods packed by other than the producing organization, may be due to the fact that some other concern has a better equipment for packing, or it may be that the manufacturer does not wish to be bothered with the details of export packing. It is entirely proper under such conditions to have the work done by some other house, and there are a number of concerns which are well equipped to give good service.

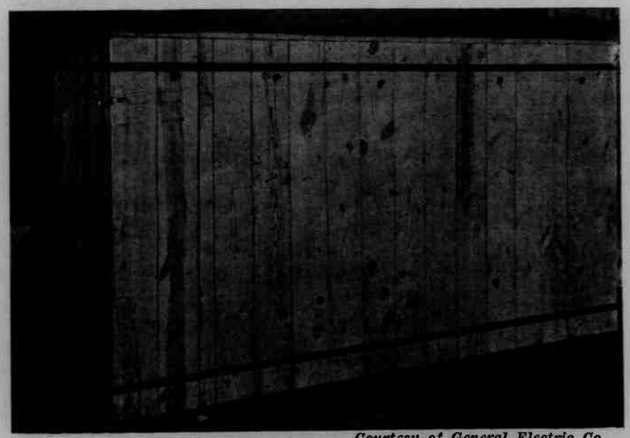
The second instance comprises that large export business which is handled by a second party. It may be a commission house, it may be a purchasing agent or it may



Courtesy of General Electric Co.

(1) Casing a Large Induction Motor.

A large motor with extended base and bearing. Note lining of cotton covered, waterproof paper, bolting to skid, blocking longitudinally and laterally, bracing and slotting for skids as fully explained in text. Note also ventilating holes covered with wire screens.



Courtesy of General Electric Co.

(2) Completed Case for Large Induction Motor.

Note ventilating holes provided to prevent accumulation of moisture by condensation and relieve air pressure on inside of case. These holes are covered on the inside by wire screen. Photograph taken before case was marked.

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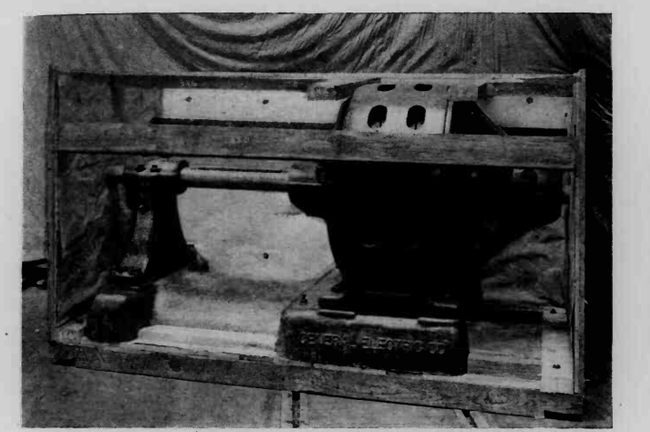

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A large motor with extended base and bearing. Note lining of cotton covered, waterproof paper, bolting to skid, blocking longitudinally and laterally, bracing and slotting for skids as fully explained in text. Note also ventilating holes covered with wire screens.

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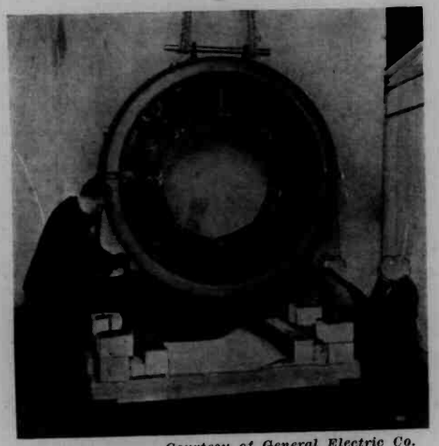
(2) Completed Case for Large Induction Motor.

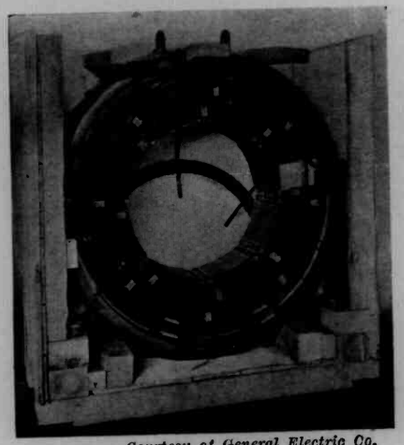
Note ventilating holes provided to prevent accumulation of moisture by condensation and relieve air pressure on inside of case. These holes are covered on the inside by wire screen. Photograph taken before case was marked.



Courtesy of General Electric Co.

(3) SKIDDING STATOR ELEMENT OF SYNCHRONOUS CONVERTER.

Note that skid is lined with cotton covered waterproof paper. Note that bearing part of skid having contact with finished part of machine is coated with rust preventative.



Courtesy of General Electric Co.

(4) STATOR ELEMENT PARTIALLY BOXED.

Note corner posts as support against collapsing. Eyelets at top are for convenience in lifting and are removed before final closing of case and fastened to inside of case.

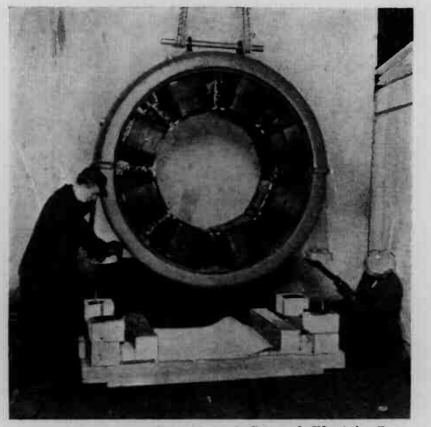
be any one of the many different organizations or individuals acting in this or that capacity. But right here is where originates a great deal of our faulty packing, and there is no doubt that vastly more comes into existence at this point than in the case of a manufacturer dealing direct with a foreign customer and packing the goods in the factory of origin.

Perils of the Triangle.—It may be that the manufacturer is doing his very best to branch out in foreign trade. He may be packing his goods suitably for shipment to seaboard, but it frequently happens that these domestic packages are not changed in the least by the actual exporter, and there is consequent loss both for the ultimate purchaser and the manufacturer himself. On the other hand the exporter of the goods may have a carefully prepared order form on which is described in detail the export package. The goods are shipped by the manufacturer, but absolutely no attention is paid to the instructions in regard to packing. When the goods come to the port of shipment they are not repacked and are sent abroad in their fragile domestic coverings.

This is not a difficult problem to solve; it is merely a question of having an agreement in reference to responsibility. Any purchasing agent or commission house should have a definite understanding with their sources of supply as to who is going to do the packing. If the manufacturer, well and good; if the commission house, then an organization must be built up which can take care of this packing problem. This is no exceptional situation, as there are a number of commission houses in New York, not to mention other ports, that have very efficient and able packing departments. To these departments all their goods are brought and repacked for export.

To be sure there is always going to be defective packing, and the foregoing paragraph has indicated where most of this defective packing will originate. There will always be the intervention of the third party, and it is probable that in many cases this third party will be more interested in the cash against documents than he is in

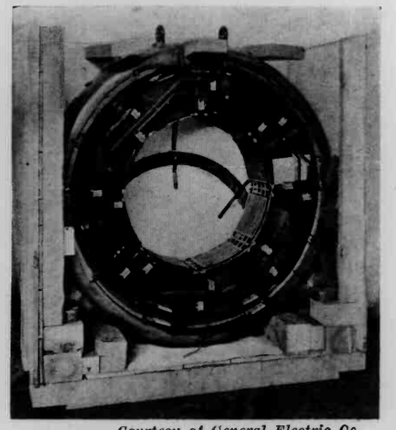
INTENTIONAL SECOND EXPOSURE



Courtesy of General Electric Co.

(3) SKIDDING STATOR ELEMENT OF SYNCHRONOUS CONVERTER.

Note that skid is lined with cotton covered waterproof paper. Note that bearing part of skid having contact with finished part of machine is coated with rust preventative.



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how the goods are packed. But be this as it may, there is still a wide field for improvement in direct shipments from the factory.

Pilfering.—Pilfering is a common hazard to which shipments are liable in transport, and many ingenious methods have been adopted to protect goods that are exposed to this danger. But still it continues to exist and many a foreign importer, be he branch manager of an export house or native of the country, has received cases apparently in good condition only to find upon examination that all or a portion of the contents have disappeared. The goods particularly exposed to pilfering are merchandise the units of which are small, such as canned goods of every kind, wines, liquors, boots and shoes, articles of clothing for men and women, stationery of all kinds, toilet articles, hardware, hats, and so on. Many schemes have been tried to meet the evil; tongued and grooved lumber, iron straps, safety clips of various kinds, etc. The use of a wire drawn tightly about the middle of a box and securely fastened into the body of the box has been recommended, but it frequently happens that wood not thoroughly dry is used for the cases and when the wood shrinks naturally the wire loosens. This is a problem that may be difficult of perfect solution. Individual ingenuity will, in many cases, however, accomplish much, and it is probable that each exporter can find a remedy applicable to his especial needs.

Proper Marking of Great Importance.—Proper marking of a shipment is of as much importance as proper packing. If the marking is indistinct, easily obliterated, or improperly placed it may cause great trouble and annoyance, without considering the possibility of loss and months of delay in receipt of the shipment. In fact, it may be stated generally that improper marking or incorrect marking causes just as much loss as improper packing, and this occurs even in instances where considerable care is used in marking and checking cases. The writer knows several fairly prominent export houses that would give a good deal to be absolutely sure that there

was never a mistake made in the marking of their cases.

The first requisite for any class of marking is legibility and permanency under all conditions to which the package may be subjected. This does not alone refer to the paint used in making the mark, but also to the place on the package where the mark is put. There is a great deal of complaint on this score in the matter of baled goods, and with this class of shipments the mark should never be placed on the bagging nor on a tag tied to the bag. Obviously both of these methods are insecure, and the marking should be done by using a plate of metal which in turn is secured to the iron bands around the bale. This will insure permanency, considering this word from every angle.

Assuming that there is legible and permanent marking, the difficulty is by no means overcome, as a great opportunity for trouble due to incorrect or improper marking still exists. Errors of this sort may be made in a great variety of ways. For example, it is very common in export shipments to find one or more letters enclosed in some geometrical figure such as a diamond or a circle. In this instance it would be a most decided error to leave off the geometrical device, just as serious as to leave off the letters themselves. In other instances we find errors in the letters themselves. For example, the letters may be **"C-M"**, but on the case they are made to appear **"M-C"**. Frequently one letter should appear over another letter and in the marks we find the position of the two letters reversed. Then again the marks may be legible when viewed close up but indistinct when seen at a distance because of the small size of the characters. It also happens, with too great frequency, that the mark is surrounded by other marks or even by advertising matter to such an extent that it is very difficult to sort out the shipment.

Marking Small Shipments.—In shipping small packages it is frequently the practice to tie a number of boxes together by iron straps, strips of wood or some other material and then to mark the top box, but this is most decidedly ill-advised. These composite shipments fre-

quently come apart, and of a lot of six boxes one only may have the mark and the other five lack any sign whatever of identification.

Errors also frequently take place in the numbering of the various parts of a shipment, and great care must be observed in this numbering. Often there is duplication, and in at least one country, Salvador, goods bearing duplicate numbers are considered contraband and are liable to a fine of 25 per cent of the duties. Incorrect marking is no subject of levity to the importer. In every instance he may be subject to fines and in almost all instances he will be subject to delay in the receipt of his goods, and he is fortunate if he does not lose his goods altogether.

Stencil not Brush Should be Used.—Marks and numbers on a case should always be stenciled and never put on with a brush. The importance of this recommendation lies in the fact that a stenciled mark or number is well made and legible, whereas the average brush artist in factory or packing room is not remarkable for the work he does. It should also be remembered that caution marks on a case are of no value if they are not in the language of the country of destination, and it is much better to keep the case clean than to cover it with all sorts of useless decoration. The same applies to advertising matter, for not only does this in many instances conceal the important marks and numbers, but it also gives a very valuable guide to thieves on the boat, wharf, or in the custom house. A case which cries to the world through advertising pasters that it contains good things to eat, shoes, or articles of a similar kind, does not have to be opened by the pilferer to discover the character of the contents. He is saved all this preliminary trouble and can proceed to go to work without the least delay.

Where to Put the Marks.—If possible, a case should have marks on all four sides, top and bottom. This would not be a waste of time, either, but in the majority of instances this is not possible. When it cannot be done, then put the marks on as many sides of the package as possible

and be careful to place the whole of the mark together instead of scattering parts of it all over the side of the package. The marks on a case are checked by the dock employees; the customs manifest must show them, and so must the bill of lading, and it may be necessary to inspect them at other times. The value, therefore, of having the marks grouped compactly so that they can be seen at a glance and without difficulty is obvious, and so doing entails no more work than putting them on different parts of the case. There is one last thought, and that is, do not use second-hand material for your export packages. The saving is practically nil and in many instances second-hand cases contain old numbers and marks of various kinds, and even with care it is frequently impossible to obliterate them all. Consequently by using this class of material we are not only saving little, but are running considerable risk of trouble of all sorts for the customer, especially in view of the fact that as a rule the resistance has been long since taken out of second-hand stuff.

Many Factors to be Considered.—There are a number of factors to be considered in the problem of packing, factors which in a sense are fundamental. First is that of methods of transportation. Generally it may be stated that domestic packing is satisfactory for shipments to Canada, but that market almost exhausts the list. The chief danger to goods, however, comes in transhipment, and wherever goods are transhipped it may be taken for granted that unless the packing is adequate there is going to be trouble. We come back therefore to the suggestion that the manufacturer study the map of the country to which his goods are going, and thus guard against what might otherwise be termed the inevitable.

Climatic conditions may materially affect the character of the package, and this observation affords another opportunity to insist upon a thorough study of geography. Conditions at foreign ports may be quite unlike port conditions in the home country and should receive study. These questions will be dealt with in the

following pages and in a special chapter. Another chapter, too, will deal with the important question of packing goods so as to minimize import customs duties in foreign countries, and this again brings us to the point of packing according to customers' instruction, for both this, and packing to facilitate entry through the custom-house, amount to the same thing: consideration of the customer's interests. If the consignee asks that machinery be shipped knocked down and in compact form, it is because there is some condition of transportation or other important consideration that has to be met. If the consignee asks that goods be sent in a series of cases and that the shipping documents show what part of the merchandise is contained in each case, there is no doubt that this request is made with good reason.

CHAPTER II

WHAT EXPORT MERCHANTS SAY ABOUT PACKING

REPLIES to a questionnaire on the subject of experiences with the packing of American goods for export, addressed while this volume was in preparation to several hundred export merchants, shipping companies and foreign freight forwarders in this country, that is to say, companies and firms engaged solely and professionally in the export business, resulted in scores of replies containing much food for reflection along with some serious criticism which, of course, was to be expected. An examination and analysis of replies received disclosed not a few valuable hints as to desirable practices, improvements in present methods and advice of real constructive value. They may be accepted as representative of replies which would have been received from foreign importers, had time permitted enquiries of them. It is believed that excerpts from some of these letters will be found of interest and value if reprinted at this point, so far as the letters from these export merchants and others are couched in general terms. Other excerpts have been used elsewhere, notably in chapters referring to proper export packing of certain commodities, when the letters related specifically to such stated subjects.

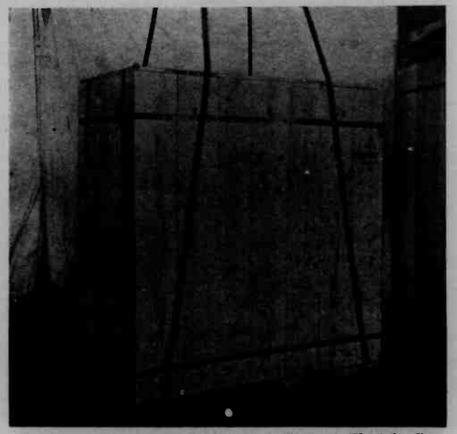
Exporters' Comments on Packing Practices

The Export Packing Department.—One of the largest export merchants shipping to the West Coast of South America declares that there is a general lack of geographical knowledge among manufacturers who seek export business. This merchant believes that the average manufacturer is not conversant even with

the location of the principal ports and cities, or, if it happens that his geographical knowledge extends so far, then he does not understand or appreciate the physical conditions governing the transportation of goods. This merchant therefore urges that any manufacturer who desires to have his goods properly packed for export must organize a thoroughly trained packing staff, which must in the first place be taught the rudiments of geography, where cities and ports are located, the means of transportation to foreign ports and of interior transportation in country of destination, and finally educated in methods of packing which will minimize so far as possible likelihood of damage from all causes.

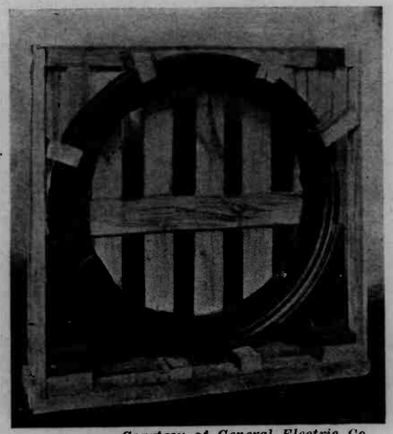
An exporter of iron and steel products urges that manufacturers and export shippers must find means of impressing upon the minds of their packing staff the conditions under which goods are handled in shipping to various destinations. He believes that even a visit to steamship docks will go far towards showing the treatment to which cases are subjected in handling from truck or lighter or railway car to the steamer. The packer must know whether goods find their way to ultimate destination by muleback, or by what other means of transportation, and must be taught that packages are handled by manual labor at many foreign ports and at others discharged from steamer to lighter or surf boat and then re-handled.

Another large export house shipping to the West Coast of South America urges that manufacturers be impressed with the fact that before dispatching shipments for foreign ports information should be secured as to shipping conditions, both in relation to the handling of the goods by the steamship companies and as to discharging conditions at port of destination. This house points out that shipments to major ports of Chile and Peru can be easily forwarded from New York on steamers sailing directly to such ports, whereas, if such shipments are forwarded by steamer to Panama, transhipment



Courtesy of General Electric Co.

(5) COMPLETED CASE FOR STATOR ELEMENT.
Note marking on case where sling cables should be applied.



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(6) CRATING THE YOKE OF A CONVERTER.
Note that bracing provides protection if crate is thrown on side or end.

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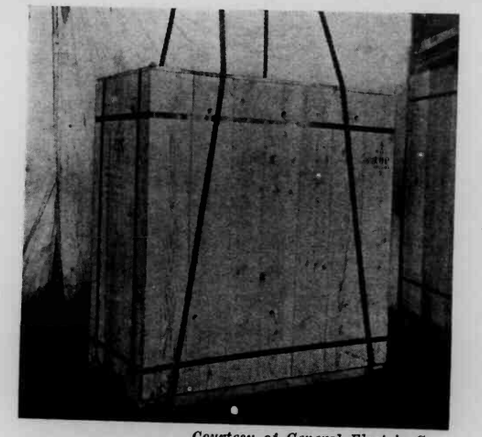

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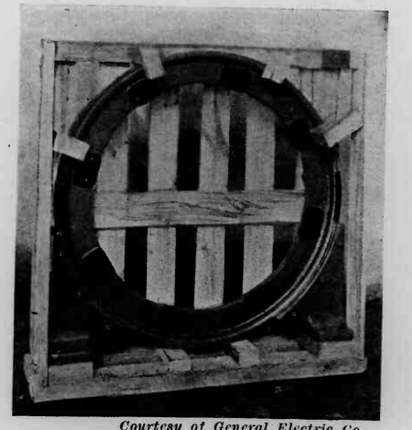

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Courtesy of General Electric Co.

(7) COMPLETED CRATE CONTAINING YOKE.

Crate affords a visual survey of contents and provides reasonable protection for semi-fragile material not subject to pilfering.

Courtesy of General Electric Co.

(8) PACKING OF 25 HP MOTOR.

Shows method of guarding against shifting of machinery in case. Note blocking to prevent side strain and blocking of shaft at ends. Note also bracing of top of motor frame.

of a strenuous character is necessitated, entailing a considerable amount of extra handling which never contributes to the improvement of export packages when arriving at destination. This house further calls attention to the fact that a method of packing which might be entirely satisfactory for one market, might be just as unsatisfactory for another market and that, therefore, manufacturers must so standardize their export packing as to make it suitable for the most trying conditions.

The New York office of one of the largest importing houses in South America, places the blame for poor export packing not on the lack of intelligence among manufacturers but on pure lack of attention and consideration. This office states that a common reply from manufacturers who have been asked to supply special packing for export is, that the manufacturer does not see why packing that is good enough for goods shipped to Brooklyn should not also be good enough for goods intended for Constantinople, and that it is quite impossible to upset the regular packing routine of the factory. When, as not infrequently happens, complaint is received about the condition of goods on arrival at destination, manufacturers almost always place the blame on the transportation companies.

A New Orleans export merchant shipping largely to Central America, criticizes the men employed to do the packing for manufacturers, who have not sufficient interest even to inquire what export packing means, nor the slightest knowledge of the correct meaning of gross, legal and net weights, and, furthermore, know nothing about and pay less attention to the packing of cases in such a way as to reduce the import duties in certain parts of Latin America, where such duties are levied on gross weight; and no importer in those countries is particularly delighted at having to pay duties on heavy lumber cases. Per contra, this exporter declares that he has received goods from manufacturers in a great many different states, ordered for export, which have arrived packed in paper cartons or veneer board crates, a ridicu-

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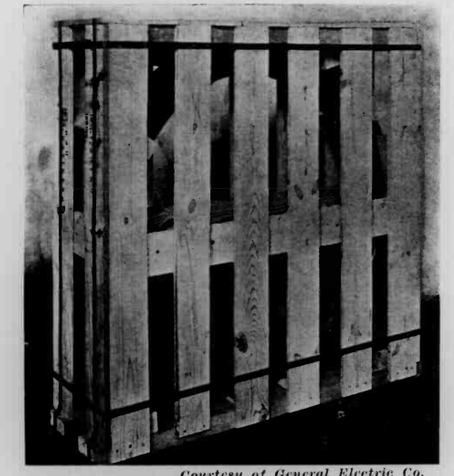

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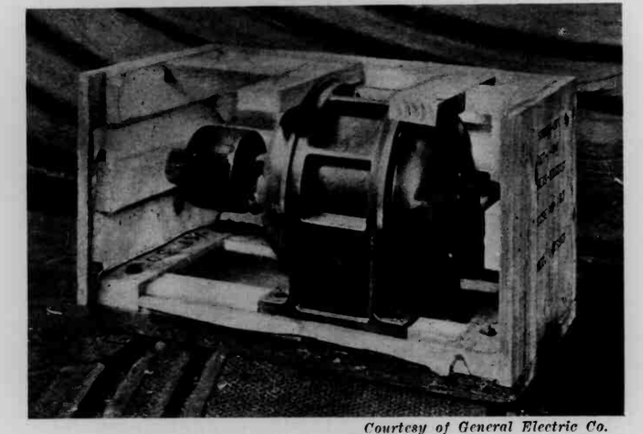

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lous proceeding involving repacking and considerable extra expense. The engagement of intelligent and reliable men in a manufacturer's export packing department, men who will take an interest in their work, study carefully every angle of export packing, is advised as a highly profitable investment.

A member of a firm in Manila, recently visiting New York, declared that losses incurred by Philippine importers because of improper packing or marking of packages are insignificant in the case of goods shipped from England, and formerly from Germany, as compared with the immense loss sustained on shipments from the United States because, in his opinion, European shippers realize better than American shippers that Manila is more than 10,000 miles distant.

Fear Cost of Export Packing.—The same Manila merchant referred to in the preceding paragraph, declares that importers will gladly pay extra for goods which they know will arrive in perfect condition. It would appear that there is a great deal too much diffidence among American manufacturers, in general, in regard to making sufficiently liberal quotations to cover the additional cost of special packing and protection for export shipments when there is extra expense on this score. This is illustrated in a letter from a prominent exporter to India and the Orient in general. He is of the opinion that while American manufacturers have adopted a distinctly better policy than their English and some other European competitors, in quoting prices which include all packing charges, instead of quoting "packing extra," yet the force of competition here in the United States has led manufacturers to cheapen their packing in order to reduce their quotations on commodities. The result, he thinks, is that they fancy they must name equally as low prices for export, and in such prices they consider that they have not a sufficiently large margin for the superior export packing and protection which perhaps they realize is necessary. The result is that in some cases the ordinary domestic packing is made to do duty for export

shipping, quite too often with disastrous results. It would be much better, this exporter advises, if manufacturers would frankly advance their prices and make them to cover thoroughly good export packing. This he thinks would be better even if a domestic price list is used, which may be modified to read to the following effect: "5 per cent. additional charged on all export shipments to cover increased expense for especially careful and thorough boxing and protection." In any event, proper export packing must be supplied and, if it costs extra, customers may easily be persuaded of the desirability of paying the extra charge in order that the merchandise on arrival will be intact and in saleable condition.

The same subject is referred to by a firm of large shippers to China and Japan, which states that it never has any trouble about packing with large manufacturers of experience in exporting, but its troubles invariably lie with small manufacturers or those who have never done any export business, who too often underestimate the cost of proper packing and therefore use skeleton crates when solid boxes ought to be employed, or use lumber too light to hold the weight of the contents, or cases that are badly designed without corner posts or diagonal bracing.

Extra Costs Versus Economies Effected.—A company engaged in exporting to Australasia calls attention to the desirability of making a careful comparison as to the expense of unusual, very heavy or very costly packing with the possible losses which may be incurred in shipping in less costly packages. This company urges caution in making such a comparison and above all in adopting any doubtful practices without a thorough preliminary and mutual understanding with customers. None the less, it is believed by this company that in some instances it may be discovered that losses through frail or very cheap packing may not exceed 1 per cent on the value of the contents, whereas, what might be considered substantial and worthy packing cases might cost 2 per cent or 3 per cent on the value. This, of course, can only be determined in actual and long continued practice. No manu-

facturer must jump at conclusions and attempt any packing which he is not absolutely sure will meet the approval of his customer. Similarly, this company declares, a comparison of the cost of bales versus cases, or cost of barrels versus shipping goods naked—all as compared with probable losses from damage on arrival at foreign port—should be very carefully and scientifically studied.

A steel exporter suggests that excess of zeal for substantial packages should be restrained by the knowledge that on bulky goods, which are freighted at rates per cubic foot, an inch or two of extra dimension costs the freight rate on another cubic foot of space, so that in packing such goods it is necessary to study economy of space by cutting down so far as can safely be done on the extreme outside dimensions, which may be considerably increased by unnecessarily heavy scantling or bracing.

Merchants shipping to Latin America observe that some manufacturers reënforce their cases by wooden cleats on all the edges. These merchants frequently find that not only do these cleats not render the cases sufficiently strong, but that this method of reënforcement makes necessary an additional ocean freight charge whenever rates are figured on the measurement basis.

Another firm of exporters to Australia urges the packing of cases to economize space so far as possible, because of the reduction thus secured in ocean freights and the increased profit and satisfaction thus obtained by the importer. The warning is given, however, that at the same time all due care must be exercised to see that goods are packed so as to insure arrival in satisfactory condition, which is the essential thing in all export trade and must be accomplished even when additional cubic measurement entails extra expense.

The American purchasing agent for a number of important enterprises in Central America declares that in spite of specific instructions which he has issued as to the packing of certain goods, some manufacturers have assumed the liberty of shipping those goods without any packing whatever. For example, heavy steel pulleys

have thus been shipped, the manufacturer believing them strong enough to stand the journey and wishing to save the expense of packing, with the result, however, that in a good many cases pulleys and other material thus shipped have arrived in perfectly useless condition.

Packing to Satisfy Customers.—The satisfaction of the customer is obviously the first principle in modern business, yet disregard of this principle in the case of foreign shipments is the subject for innumerable complaints among the letters from export merchants, shipping companies and freight forwarders, to which this chapter is devoted. There are too many of these complaints to warrant reprinting here, but the fact is notable that the critics attribute the difficulties which they have expressed not to any lack of intelligence among manufacturers, but rather to forgetfulness of or indifference to the fact, that the customer in China or the customer in Chile is just the same kind of a customer as he who lives and thrives in Indiana. The safe and sound arrival of goods, says a New York house engaged in exporting to South Africa, is the criterion by which shall be judged the future success of a manufacturer in the South African markets. The manufacturer who ships out goods badly packed, which arrive partly lost and partly damaged because insufficiently protected against the many risks of ocean voyaging, may or may not receive a repeat order for his goods. If he does and if a second shipment arrives in similar condition, the manufacturer may as well retire from that trade, for conservative South African importers will want nothing more to do with him. Furthermore, it should be understood that safe and sound arrival of goods may very often mean a good deal more than the mere arrival intact of the merchandise. The term may also involve the arrival of packages or cartons in clean and presentable condition which will make a good appearance on the shelves of dealers, this in itself helping to dispose of the goods and increase sales. White paper cartons should not be stowed next to heavily oiled case lining paper. If they are, the cartons will inevitably be

stained and very likely so unsightly that they cannot be displayed. A little thought as to the natural desires and likes of the retail merchant, ought often to be a good guide to the manufacturer in determining how he must pack his goods so that they will arrive in the retailer's shop in condition to please him, sell the more readily and induce more frequent repeat orders.

An exporter dealing with Latin America emphasizes the same point and urges the desirability of always consulting customers, very especially in Central and South America, as to the special packing which those customers may desire. This exporter is of the opinion that manufacturers should do this when they quote prices and urge orders. The prospective customer should be asked to give definite instructions as to just what style of packing will best suit him, and the manufacturer may make a strong selling point in so doing because he may thus convince his prospective customer that the latter is quite sure to receive his goods just as he wants them. Moreover, the manufacturer should always fully understand that his customer knows what he wants, and the customer should be informed that if all goods of a certain class have to be packed together and all goods of another class packed separately, this can only be done when precise instructions have been received by the manufacturer, and in the absence of such instructions the manufacturer can do no more than use his judgment based on whatever information he may be able to secure in this country. Co-operation with the customer in this respect is advocated by this exporter as tending to the better satisfaction of the customer and the increase in trade, also as one of the strongest and most effective sales arguments which the manufacturer can use.

Advantages Secured Through Good Packing.—Advantages in ocean freight rates may sometimes, although perhaps not frequently, be secured when export cases are of the highest type possible. Thus, a San Francisco house exporting largely canned goods and dried fruits declares that some steamship lines allow a better freight rate on

boxes that are strapped than on those which are not strapped, the rate to England on canned goods being $1.75 strapped and $1.80 not strapped.

Other advantages in the matter of reducing freight charges through intelligent ways of packing goods include not only packing to reduce the cubic measurements, to which letters already quoted have referred, but the following hint from an export house doing business in Europe. A great saving in freight charges, it is pointed out by this house, can be effected by manufacturers by an endeavor, unless other considerations prevent, to pack the containers in such a manner that they will be accepted by ocean carriers on a weight basis. In other words, to pack if possible more than 56 pounds to the cubic foot. This can be done in the case of iron pipe fittings, for example, by avoiding the packing of large sizes only in a barrel and including in the same barrel the smaller fittings placed inside of the larger ones, thus reducing the total measurement of the shipment.

Again, one of the principal New York exporters shipping to the West Coast of South America, points out the neglect of some manufacturers to utilize all packing space, and writes of a shipment in which automobile tires were dispatched packed in cases, the entire hole of the "doughnut," within the tire, being left quite empty notwithstanding the fact that on the same order there was a quantity of small sundry items which could readily have been packed in this empty space. The result was heavily increased freight charges, and a large part of those charges were for empty space only.

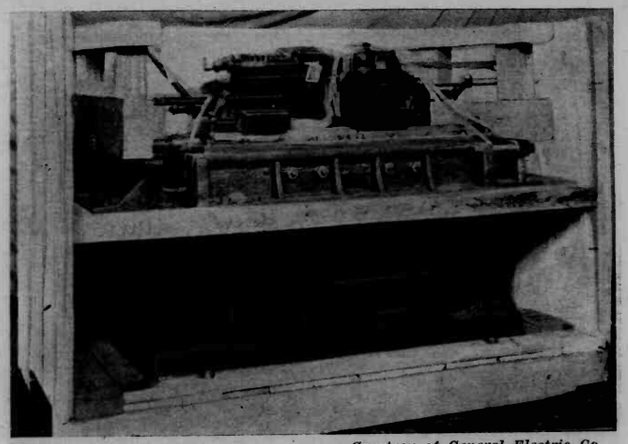
A foreign freight forwarder declares that more favorable rates of marine insurance, and especially very much lower rates for insurance against pilfering, can be secured when strong cases instead of second-hand cases are used, and they are properly strapped and sealed in such a fashion as to make pilfering extremely difficult.

A firm of important exporters to Australia insists that cases be lined with proper waterproof materials, because of the fact that insurance companies give them a

reduction in premiums on policies when this is done.

Another large New York house shipping to South America declares that New York underwriters have been paying special attention to American packing methods in order to obtain a guide as to fixing future rates of insurance against pilferage and breakage. Many heavy claims have recently been paid, and some insurance companies feel that on account of these claims shipments in any except approved packages are extra hazardous. This New York house states that it knows that these claims are almost invariably valid, and it declares that the South American merchant much prefers to receive his merchandise in good condition rather than be forced to depend upon claims which are difficult of collection, and the best of all ways of avoiding claims is through proper export packing.

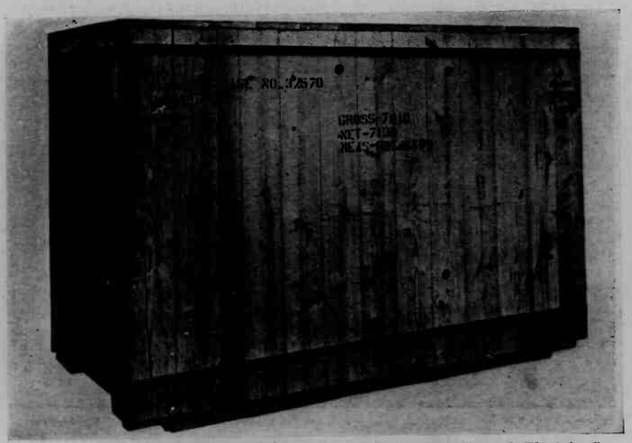
Influence of Export Merchants on Packing.—Doing export business through the average export concern, export merchant or commission house, involves considerations affecting packing similar, in general nature, to such considerations which enter into the problem of doing direct business with and making direct shipments to customers in foreign markets, and also involves certain special considerations to which sufficient attention is not always given by manufacturers. In principle, all export merchants in this country ought to inspect cases which are received from manufacturers for shipment to the exporter's foreign customers, and determine before shipments are loaded on board vessel whether, at least from superficial appearances, the cases, barrels or what-not are suitable for overseas transportation and inland transportation at point of destination. While it is quite probable that export merchants do not thus inspect all shipments sent in their care for foreign dispatch, yet their attention is sure to be drawn to any weak or frail cases by the receiving clerks on the docks of ocean steamers, who may either refuse to accept unsatisfactory cases, may advise the exporter of the fact that cases are not suitable, or may accept them and endorse the bill of



Courtesy of General Electric Co.

(9) METHOD OF PACKING WELDING MACHINE.

Machine is shipped complete with top mechanisms leaving considerable empty space. Note cribbing supports ensuring against collapse of box.



Courtesy of General Electric Co.

(10) COMPLETED CASE FOR WELDING MACHINE.

Note marking in English, French and Spanish and arrow indicating top of case.

INTENTIONAL SECOND EXPOSURE

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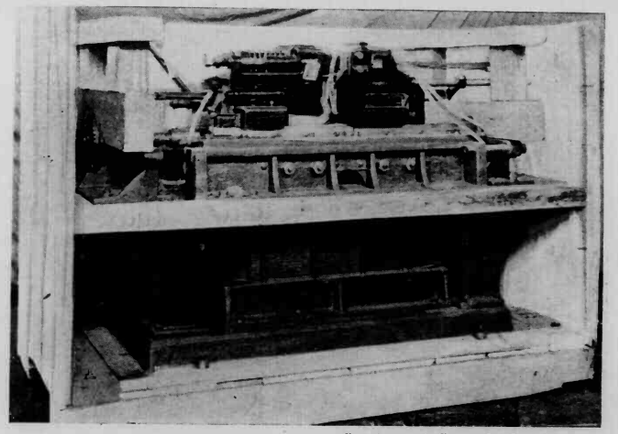

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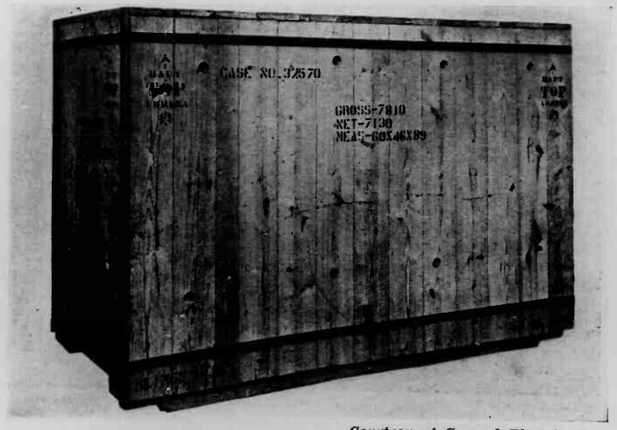

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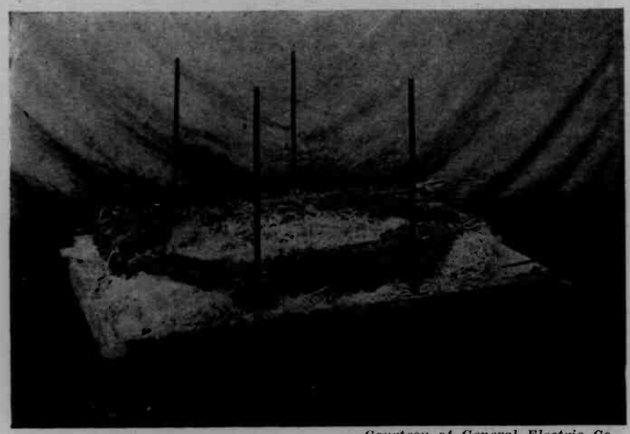


Courtesy of General Electric Co.

(11) METHOD OF PACKING GENERATOR COILS.

Illustrates use of shock absorbing materials and devices. Note bed of excelsior conforming to shape of coils.

Courtesy of General Electric Co.

(12) BOXING OF GENERATOR COILS.

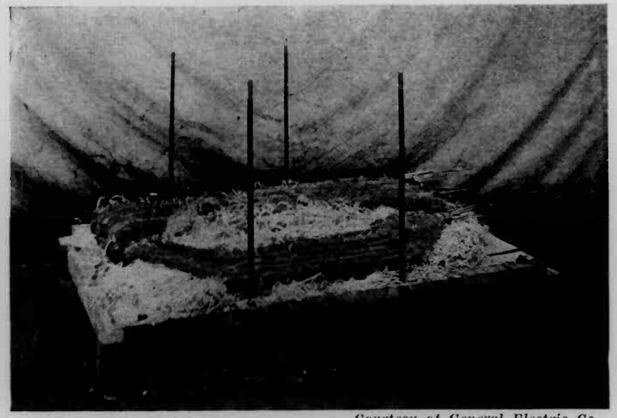
Note position of top bracing, making each case thoroughly rigid. Note also cushioning and separation of rows of coils, each self-sustaining, by timbers padded with heavy felt.

lading with the statement that certain packages are in bad condition when received. The latter is an alternative which no exporter and no banker handling shipping documents is pleased to have happen. Accordingly, in such instances exporters are very frequently called upon to repack goods or to recooper broken or weak containers. So doing involves expense. No manufacturer can depend upon an exporter to ensure the dispatch of the manufacturer's goods in proper condition. It is the manufacturer's duty to his foreign customers and to his own prestige and future trade, so to ship his goods in the first instance that they will arrive safely in the best possible condition. The exporter is not a buffer, and if expenses for recoopering, etc., are incurred, it is very certain that they will be charged back to the manufacturers at fault.

Again, the foreign customers of an export house who receive the commodities shipped through the mediary of the export house in question, may make demands for damages incurred from bad packing, about which the exporter may not have known or had any opportunity of learning. Such claims on the exporter are certain to be passed back to the manufacturer from whom the goods originally came. The exporter cannot be made "the goat" in such instances. The manufacturer should in the first place have supplied goods properly packed.

Further, manufacturers must recognize the fact that exporters will not, when they can avoid doing so, give their orders to those suppliers who refuse to heed specific instructions given them regarding packing, or who uniformly supply merchandise improperly or insecurely packed for foreign shipment. Exporters will give preference to manufacturers who supply the necessary and the right sort of packing, and who follow implicitly the instructions regarding the way in which goods should be packed, usually printed instructions, which the exporter gives with his orders. All of these features are brought out in the letters from exporting houses which are now under review.

INTENTIONAL SECOND EXPOSURE



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One of the largest houses shipping to the West Coast of South America complains that its requests for special attention to export packing are often entirely ignored. He has found some manufacturers, however, who have been acquainted with export business for years and are therefore familiar with its requirements, and it is those houses to which this exporter always gives business by preference instead of to competitors.

A firm doing business with the River Plate countries writes that it has printed on its order sheets special instructions regarding the packing required, which are printed in red ink to ensure their receiving proper attention, yet in spite of this goods are continually being received in old, second-hand and recoopered cases, even though the instructions on their order blanks include a cut of a proper packing case. This firm also complains that manufacturers are very often delinquent in failing to give proper gross and net weights of their cases, and owing to manufacturers' carelessness in this respect they have been fined at least twenty-five times by the custom house of one foreign country; and that manufacturers generally ignore any claims made on them for shortage, or damage on account of bad packing, and refuse to entertain claims for fines which have been incurred through their own carelessness.

A firm of foreign freight forwarders declares that failure to provide proper packing often makes it necessary to have packages recoopered at American port of shipment, the cost of so doing being in many cases greater than would have been the cost of providing suitable packages in the first place. Furthermore, of course, only the most flagrant cases of unsuitable packing appear to demand recoopering before shipments leave this country, although in many other instances shipments go forward when the bad packing is not obvious, and no trouble is suspected until goods arrive at their destination.

A house which ships largely to the West Indian trade is of the opinion that a large proportion of the complaints which reach this country of bad packing on the

part of American manufacturers, are to be explained by the fact that many manufacturers know nothing about exporting, while others skimp on their packing with a view to lowering the price of their goods. This house believes that exporters will have to leave such manufacturers severely alone, and deal only with those who send forward their shipments in a way that will do credit to our methods and our desire to meet fully obligations to foreign customers.

The New York buyer for one of the largest importers in South America says that he has endeavored to teach manufacturers from whom he buys the necessity of good packing, and the fashion in which merchandise which he purchases must be packed, but that the attempt has been a thankless task. Being direct buyers, they have too often found that after they have paid ocean freights and custom house import duties they have exported so much broken merchandise, and the manufacturer's mind is a blank when he is approached on the subject.

A San Francisco house engaged principally in the export of dried fruits, suggests that all export shippers ought to agree together to handle only goods which are packed in cases of the right description and strapped at both ends.

Important exporters to Australia give the following as an illustration of the expense to which some manufacturers have been subjected on account of their failure to follow instructions regarding packing given them by export houses. Recently a Chicago manufacturer shipped a lot of hardware to New York on the order of this exporter, which upon arrival here was picked up by the truckman and delivered to the steamship pier. There the steamship officials rejected the shipment because packages were not suitable. The exporter's representative went to the pier to examine them, found that the cases were of very old lumber, evidently used several times over, because there were numerous indications of a variety of old marks which had been partially erased. The exporters, therefore, had to entirely repack this

shipment in new cases and made claim on the shippers for the expense incurred for labor, cost of cases and additional storage and cartage charges. The suppliers had not followed instructions and were therefore held responsible.

It is to be noted, however, that export merchants themselves are by no means above criticism when complaints are made of the bad condition in which American goods shipped by them have been received in foreign countries. It seems certain that a good many export houses do not give sufficient care and attention to the fashion in which the goods which they dispatch have been originally packed, and their condition when they are put on board vessel. In the majority of instances exporters know nothing at all about the cases which they ship unless they are in such a very bad condition, so flagrantly damaged, or so obviously impossible, that receiving clerks refuse to accept them. Yet another criticism to be made of exporters is offered by an export house itself which specializes in shipping tin plate and steel products. This house remarks that in many instances insufficient export packing is the fault not of the manufacturer but of the exporter, who frequently buys goods for export at domestic prices, in packages used for domestic deliveries, because he is primarily intent on quoting lower prices than do some of his competitors, and is unwilling, therefore, to pay the extra cost for adequate export packages.

A large general export house shipping to all parts of the world, complains of the practices of manufacturers in carelessly numbering and marking cases, and remarks that "as the work of re-numbering has often to be left to the intelligence of a truckman, errors are frequent in invalidating consular invoices and resulting in fines in foreign custom houses." This may be characterized as a criticism of the exporter himself, who certainly is at fault if he entrusts the rectification of errors to an ordinary truckman. If fines are in consequence imposed, the remedy is obvious, namely, the supervision of export shipments by his own competent employees.

Merchants shipping to Latin America contend that manufacturers do not give sufficient attention to the strength of their cases, and write of the cargo of a certain steamship which went aground and had to be towed back to New York, where, upon discharge of the cargo, it was found that most of the cases of their shipment on board the steamer in question were broken, which, they write, would not have happened if cases had been properly constructed and iron strapped. A critic, however, is quite sure to demand to know why these exporters had ever allowed such cases to go on board the steamer. For the sake of their own good name and their future trade with the customers to whom these shipments were addressed, the exporters themselves ought to have made certain that the goods which they forwarded were properly packed. This is always done, for example, by the New York office of large South American mining interests, which writes that it has a special inspector charged with examining the packing of all goods before they leave this country. In this instance the matter is one of prime personal interest, since the goods are for the use of the company which buys them. Perhaps in too many instances the ordinary exporter has not the same interest in his foreign clients that he might have if he himself were the client. In others, incompetent labor is employed.

For example, an illustration of the latter point may be found in a letter from a firm of foreign freight forwarders, which tells of poor packing in a certain instance where several hundred cases arrived in New York, every one of which was in bad condition on arrival; and all had to be recoopered before the shipment could be removed from warehouse, and even then the nature of the cases was such that they did not hold, and upon being delivered to the steamer pier by truck they had again to be recoopered before being placed on board the vessel, and finally arrived at destination in very bad condition. Clearly enough, this is an instance of pretty poor work on the part of the carpenter employed by the forwarding

house, which is further to be criticized for allowing the goods to go forward at all unless in thoroughly satisfactory condition.

Specific Recommendations of Exporters

Export Cases.—From many letters received from exporters bearing on the subject of the kind of export cases desirable, the following may be selected. A firm of very large shippers to China and Japan writes that it has found that there is a point where a package is heavy enough to test the limit of the ordinary man's strength and not heavy enough to warrant using two men or employing a crane, wheelbarrow or hand truck, with the result that, while such a case can perhaps be carried, when it comes to putting it down it is dropped because too heavy to be borne in the stooping position. Breakage is sure to result if contents are at all fragile, and to guard against this it is preferable that the supplier put up a heavier package which will require handling by two men or the use of a sling.

An exporter who is chiefly engaged in shipping foodstuffs writes that in his experience, because cases containing canned goods in tins, jars or bottles are made of too light timber, at least 12 per cent of the shipments do not reach destination in saleable condition.

The disastrous effects of carrying out in export shipments experiments which have been made in domestic shipments, are related by an exporter in connection with a shipment of insulated copper wire which came to his attention. It appears that the manufacturer, a prominent concern, tried out a new system of packing for the domestic trade, using three-ply veneer wood in order to effect economies in cost, and met with success here at home. Thereupon they tried the same method in export shipments, and the exporter who writes of this example happened to be personally in the warehouse of one of the customers in Havana, when out of 38 cases 27 arrived in unusually bad condition, in one instance all that remained

of the case being the iron straps. Fortunately, the merchandise was intact, but its condition was not improved by the exposure to which it had been subjected.

Shippers of mining machinery and supplies to South America advise that their rule is as follows, in order to decrease as far as possible the danger of loss or breakage of material due to the lack of adequate packing: Boxes must be constructed of not less than ⅞-inch lumber or thicker, according to size and weight of contents. The ends must be paneled, made of double thickness lumber laid crosswise, wooden battens at least ⅞ inch by 3 inches provided all around each end, with substantial strap iron nailed around these battens, ends lapping. The usual ½ inch by No. 28 gauge strapping or twisted wire being practically useless, they insist on the use of 1 inch by No. 18 gauge strap iron. All fragile articles, glassware, etc., must be carefully packed in a case floated within a strong outside box, with a liberal quantity of cushioning material between inner and outer boxes.

Checking and Weighing.—The prime importance of counting, recounting, checking, rechecking and weighing goods before being packed is insisted upon by all experienced exporters. The manufacturer must be absolutely certain that the contents of each case are exact and identical, in count and weight, as well as description, with the articles supposed to be and invoiced as contained in the case in question.

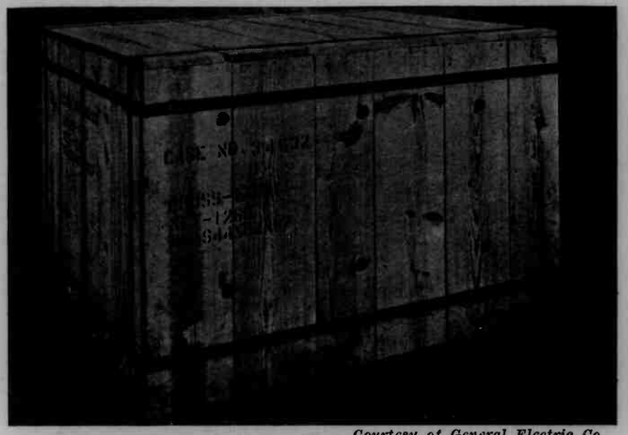
A New Orleans export commission house dealing chiefly with Mexico and Central America, lays particular stress upon the necessity for careful weighing of all contents of packages as well as the entire packages themselves after packing is completed, so as to secure correct net, legal and gross weights, and thus avoid fines which may be imposed on customers and which mean not only loss of money and great annoyance and irritation but in many instances eventually lead to loss of trade. This loss of trade will originate with the customer who has suffered directly from improper attention to these details, and also from other houses in the same market,

whose business might have been secured through the satisfaction and the good will of the first customer.

Strapping Cases—Protection Against Pilfering.—A well-known export house in the Latin American trade writes of two different American manufacturers who were accustomed to place straps around cases in the same direction that the boards of the cases ran—thus making the straps practically of no value, as they, of course, can only hold the parts over which they are nailed—instead of reënforcing the entire case by running the bands in the opposite direction to the boards. The iron banding of cases serves, of course, two purposes. First, reënforcing the strength of a package, although as a prominent firm of exporters remarks, it is quite useless to hope to strengthen a frail package with hoop iron, as boards in many such cases are hardly strong enough to hold the nails. Banding also helps materially to diminish the risk of pilfering, which has grown seriously in recent years.

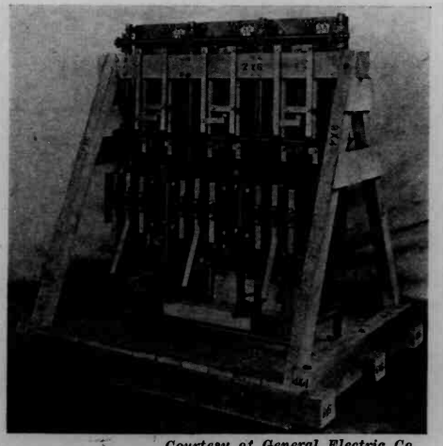
A firm of South American shippers points out that pilferage of cases containing sundry commodities is almost certain to occur unless cases are properly reënforced so that they cannot easily be opened; and, since rates for insurance against pilferage have been increased, many shipments do not carry this risk, and losses incurred are not encouragement to customers to continue trading. Another exporter doing business largely with Colombia objects to the practice of marking the contents of packages on the cases, which not only invites pilferage but instructs thieves just where they can obtain the greatest results for their efforts. If all cases are unmarked as to contents doubtless a large number of cases would be opened by thieves in course of transit, but there would be fewer goods missing on arrival at destination, because the thieves would have wasted a good deal of their time in opening packages containing goods not easily to be disposed of and not worth pilfering.

An important export house specializing in automobile accessories submits the following suggestion received



Courtesy of General Electric Co.

(13) Completed Case Containing Coils.



Courtesy of General Electric Co.

(14) Method of Packing Switchboard.

Switchboard is shipped without being knocked down. Note "A" frame support and cross tie to prevent switchboard from overturning.

INTENTIONAL SECOND EXPOSURE

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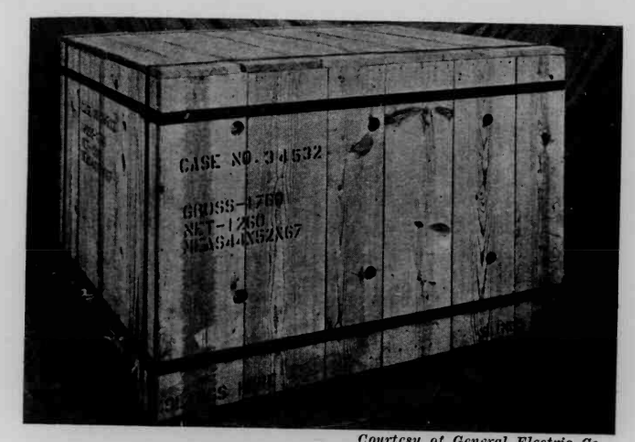
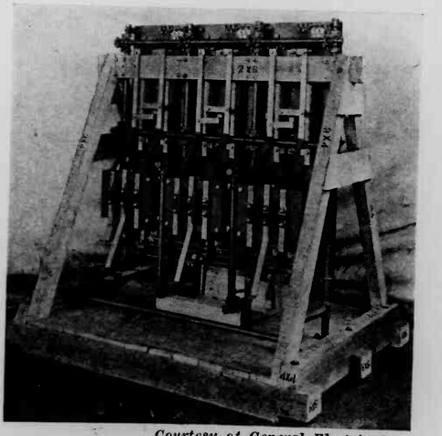


Courtesy of General Electric Co.

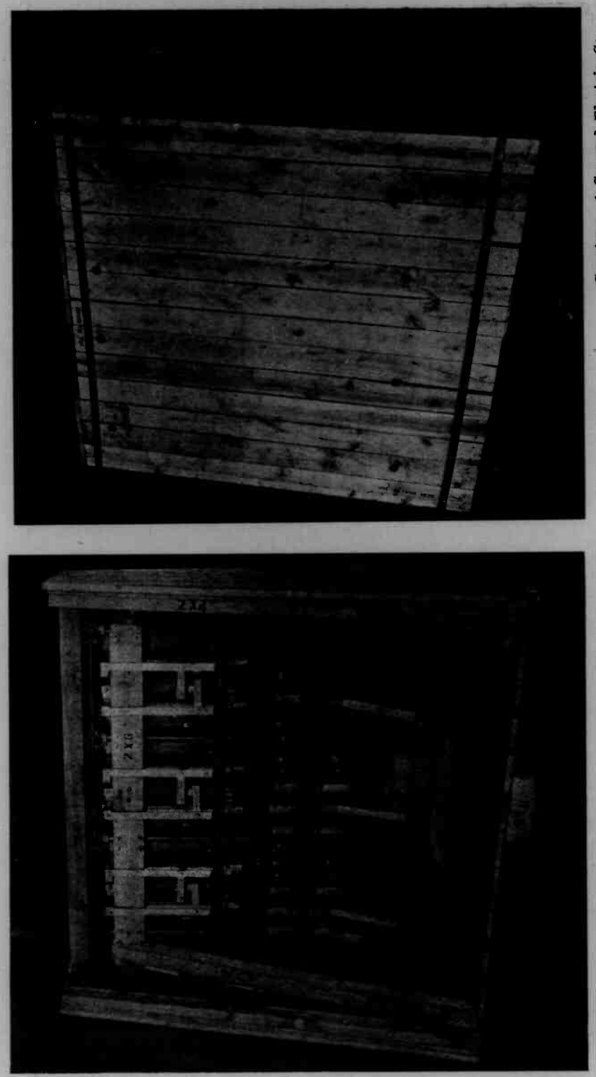
(13) COMPLETED CASE CONTAINING COILS.



Courtesy of General Electric Co.

(14) METHOD OF PACKING SWITCHBOARD.

Switchboard is shipped without being knocked down. Note "A" frame support and cross tie to prevent switchboard from overturning.



(15 and 16) Boxing of Switchboard. *Courtesy of General Electric Co.*

(Left) Switchboard with two ends and side of case in position and "A" bracing fastened to case. Note that box containing sundries is firmly attached to floor of case. (Right) Switchboard completely boxed. Note that case is constructed in "A" shape to indicate that it should ride in an upright position.

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Another firm of foreign freight forwarders emphasizes the desirability of steel sealing straps, drawn tight by machine and nailed in such a fashion that a board cannot be removed without being noticed. This especially in the case of shipments of shoes and leather. Another firm of South American exporters emphasizes the bad policy of using advertising matter on the outside of cases; this is an aid to pilferers who are thus told what the contents are. Safety seals must be used, as by ordinary strapping pilferage is not prevented, since straps can simply be removed and put back again. Pilferers, this firm remarks, are generally found in the holds of vessels or on the docks or even in the custom houses of foreign countries, and must not be encouraged by having drawn to their attention goods which may profitably be stolen.

A large steamship company maintaining services to the West Indies and Central America, refuses to accept for transportation shipments of boots and shoes, cigars, etc., unless cases containing such goods are protected by metal straps or wires secured by lead seals at the ends, or "some equally effective device."

Tin Case Linings.—The use of hermetically sealed tin linings for cases is advocated by some exporters as the best possible protection of goods most easily damaged by moisture or sea water baths, but in addition to this commonly urged advantage it is to be remembered, says a shipper to India, that such tin linings are of very great value in shipping to some tropical countries as a protection against damage by insects. The objection to the use of tin or zinc linings is naturally the very great cost involved. On this score, a large export merchant writes recommending that manufacturers install and maintain

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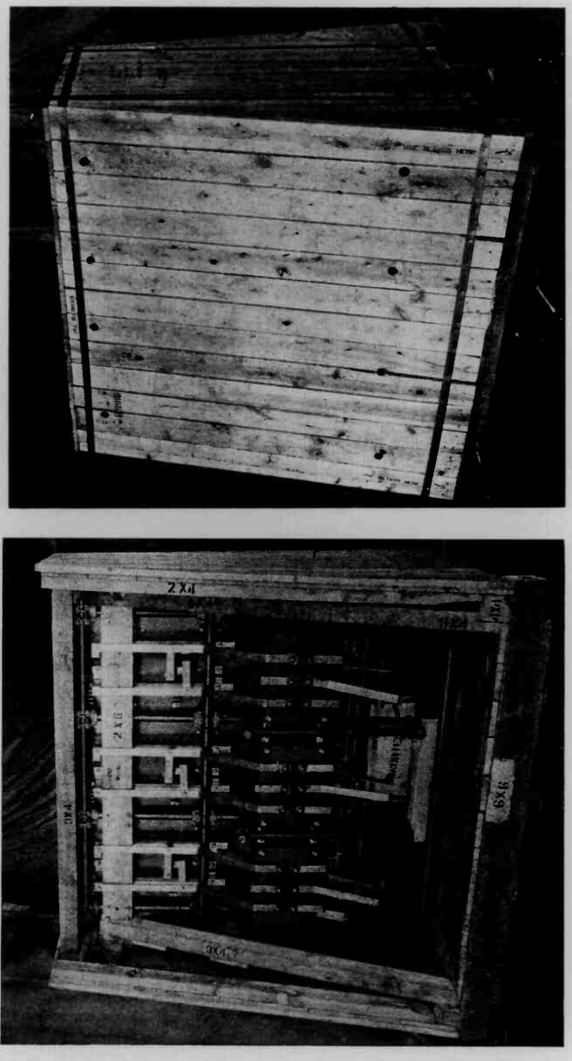

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their own tinning department and not "give occasion to the next door tinner to blackmail them."

It is also suggested by a house exporting to the Orient that if manufacturers fear to quote prices which will include the cost of tin linings, anticipating that such quotations may not compare favorably in the minds of their foreign customers with quotations made by competing houses which do not include tin-lined cases, in such instances manufacturers may easily quote in two different fashions: First, for goods to be packed in ordinary waterproofing material, and on this score they may assure their foreign customers that every care and attention will be given to thoroughly adequate waterproofing; second, they may at the same time offer to pack in tin-lined cases which will make safe arrival absolutely certain at such and such additional costs, giving their customers their choice as to how they want their goods shipped.

Marking of Cases.—Innumerable letters received in reply to the questionnaire addressed to exporters and shippers, emphasize strenuously the great importance of marking and numbering export cases.

A gentleman from the Philippine Islands recently visiting New York, protested against the tremendous losses incurred on this score by importers in Manila, stating that at the time he left Manila there was merchandise in the unclaimed warehouse of the Manila custom house valued at between $25,000 and $30,000, which was not susceptible of identification, as regards marks and brands, because of the mutilation or destruction of their flimsy containers and utter indifference of the shipper in protecting his goods. Bales of textiles arrived entirely stripped of covering and without any marks to identify them. Heavy iron jacks, weighing between 90 and 100 pounds each, were shipped in a flimsy fibre box which on arrival was in shreds and could not be identified. Railway spikes packed in a flimsy jute sack, and casks containing bolts and nuts weighing two or three pounds each, arrived without identifying marks because the containers were practically destroyed. Iron building bars

arrived without the slightest evidence of packing marks or brands.

A large New York firm of general exporters remarks that every export merchant specifies on his orders the shipping marks which are to be applied to the containers, yet this firm often has packages arrive inscribed with their New York address and the manufacturer's trade mark, but with the shipping mark and numbers of the boxes, if they appeared at all, almost invariably tucked away in a corner or on a paper tag attached to the package; although this shipping mark is the real address and identifies the shipment in the foreign port where the New York house may be quite unknown, or where packages from one New York shipper have to be separated and delivered to different consignees. This firm emphasizes the importance of stenciling the shipping mark and serial numbers in large letters on the package, and putting the New York consignee's address on a small tag. The same firm recommends that shipments to the same consignee be numbered consecutively from one shipment to the next, that is, if the last shipment finishes with case No. 1,000, the next will begin with No. 1,001. This concern has observed that the majority of small manufacturers always begin each shipment with No. 1, even though shipments may be made only a day or two apart and a number of them may go forward on the same steamer, in which case the packages have to be re-numbered consecutively by the New York concern. It has known instances of ten shipments being received, all bearing the same mark and each shipment numbered from 1 up.

Another New York firm urges that a packing list should be placed inside of each case, showing not only the contents of the case but the same markings as those which appear on the outside of the case. This is a protection when the case markings are accidentally removed or blurred.

The American purchasing agent for a large South American industrial plant protests vigorously against the way in which steel material has been shipped, the

address and mark appearing only on a tag, which is certain to be pulled off by the handlers in loading on board vessel or in unloading at port of discharge.

A foreign freight forwarder in New York urges that all marks be made by stencil, and declares that painting the marks on with a brush gives occasion for a great many mistakes in customs houses at foreign ports, because many such marks are blurred and almost obliterated before port of destination is reached. However, a mark put on with a stencil must be properly waterproofed.

An important steamship company calls attention to its printed circular of instructions regarding marking which reads: "The attention of shippers is especially called to the fact that the marking and packing of freight is a most important factor in the export trade, and instructions from consignees as well as regulations of the various foreign countries should be strictly observed, as failure to do so invariably results in fines, delays and annoyance at destination. Packages should be marked with ink, not crayon or otherwise, and all marks must be distinctly legible. Several Latin American countries require that all marks be plainly stenciled, brush or other kind of marking being prohibited by law. The port of destination should be distinctly marked on all packages, and in order to prevent goods from going astray shipper's name and address should be shown on each package. Abbreviations frequently cause confusion and delay. If shipments consist of more than one package, all packages must be numbered consecutively in addition to other marks, and gross and net weights clearly shown thereon, and always in kilos on packages destined for Latin American countries. It is desired to impress upon shippers the importance of having numbers, weights and other marks shown on packages, agree in every particular with those indicated in bill of lading and consular invoice, where the latter document is required, as the slightest discrepancy causes delay and complications and usually results in

fines and heavy expense to the consignee. as well as possible confiscation of the property."

A merchant house shipping to Scandinavia writes, that too many American manufacturers consider proper marks as a matter of slight importance. Many difficulties have been experienced because shipments have not been properly marked. Intolerable inconvenience and confusion are caused when merchandise arrives and marks have become obliterated while en route.

CHAPTER III

THE CONSTRUCTION OF BOXES, CRATES AND BALES

By H. N. Knowlton [1]

Boxing and Packing Specialist, General Electric Company

Two Principal Factors.—The two important factors in export packing are adequate protection from loss and damage and minimum cost. Adequate protection is the more important of the two, as the delivery of the goods in undamaged condition is generally the primary reason for packing. The factor of cost is important because the keen competition in export trade, both foreign and domestic, makes minimum delivery costs absolutely necessary. Packing may affect ultimate delivery costs in any one or all of the following respects: cost of the container or packing materials; cost of labor in packing; insurance costs; freight rates both ocean and railroad; storage costs; cartage costs and import duty.

The ideal export packing is that which will deliver the goods to the foreign customer in perfect condition at minimum cost. The endeavor of many American exporters, however, to reduce their packing costs to a minimum without giving enough consideration to the more important factor of adequate protection, together with a lack of knowledge of the hazards of loss and damage which are encountered in export shipping, are the principal causes of improper packing of American export goods.

[1] 1910-1917, Asst. Engineer in Forest Products, U. S. Forest Service. 1917-1919, Captain, Ordnance Dept. U. S. A., in charge of Packing Service. 1919-1920, Manager Packing Service Dept. Safepack Mills, Boston, Mass. 1920, Boxing and Packing Specialist, General Electric Company.

Export Versus Domestic Packing.—Export packages must of necessity be more securely constructed than domestic because the conditions of export shipment are so much more severe. As an example, a shipment to the Andes districts of South America first moves to seaboard either by express or freight. Upon arrival at seaport it may be carted to a warehouse and stored before ship space is obtainable. From the warehouse it is handled to the dock and from the dock into the ship's hold, probably either by means of a sling or a net. It is stowed away in hold with other freight and possibly with heavy packages on top of it. The ship encounters rough weather and pitches considerably, causing the cargo to shift and the packages to weave back and forth loosening the nails in boxes and crates, loosening hoops on barrels and driving heavy packages against weaker ones. Upon arrrival at port the shipment, because of a poor harbor, must possibly be discharged into lighters in a choppy sea. The aim is to lower the sling load of packages into the lighter with as little impact as possible, but a sudden swell raises the lighter and the load hits it with a bang. The lighter is towed to the dock amid dashes of sea spray and the packages discharged. Possibly there is a lack of storage space and they are left on the dock in the rain for several days, where they are of easy access to pilferers. They are then handled by freight to a point in the interior, and thence loaded on mules for a several days' trip to final destination. Owing to the hazards just mentioned packing which is entirely satisfactory for domestic shipment may be and generally is entirely unsatisfactory for export.

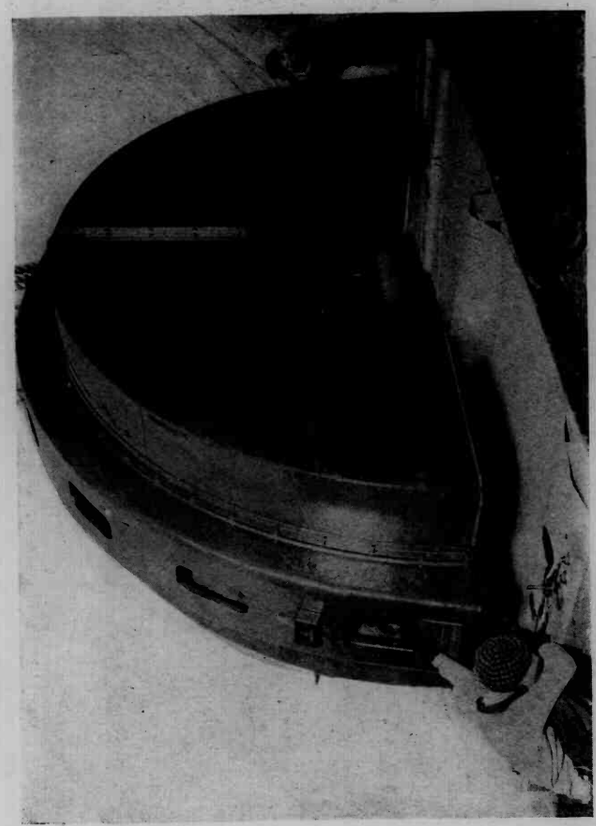
To pack correctly for any foreign market an intimate knowledge should be had of the port conditions, transportation facilities and climatic conditions of the country of destination as these all have a vital bearing on the necessary protection from damage. A knowledge of the method of levying import duty is also very important, as in some countries the duty is levied on the gross weight of the package and unnecessarily heavy containers may

make the import duty more than the value of the goods.

During the past few years extensive tests of various containers and packing materials have been made, particularly by the Forest Products Laboratory of the United States Forest Service. The qualities of various woods have been exhaustively studied and the relation of these qualities to wooden package construction has been determined. Nails and other fastenings used in wooden packages have been investigated and rules worked out for their proper use. The efficiency and limitations of different types of containers, and the effect on their strength of the character of the contents and the method of packing have been carefully studied. The results of these tests on containers and packing materials have from time to time been published and have also been embodied in various specifications, the most complete of which are the several Packing Specifications of the War Department. The export packing instructions which follow are based largely on the War Department specifications, although use has also been made of other authoritative data on the subject.

Box Construction.—The construction of wooden boxes for export is a subject which demands much careful study. The type of box selected, the species, quality and size of lumber used, the method of nailing and joining the parts together, the method of strapping and the method of packing the contents in the box all vitally affect its efficiency and serviceability.

In general, except for light boxes such as canned food boxes and similar containers, cleated boxes should be used for export service. The cleats tie the box end together, preventing it from splitting and also add more nailing surface for nailing the sides, top and bottom to the ends. They also stiffen the box end and are of great value in resisting the thrust which occurs when the box is dropped on its corner, or when heavy weights are stored on top of it as is often the case in the hold of a ship. It is also much more difficult to pilfer a cleated box than one without cleats.



(17) Method of Packing Heavy Machinery. *Courtesy of General Electric Co.*

Top half of a stationary armature weighing over 15 tons. Note protection by rust-preventive compound, use of waterproof paper, slotting of skids and timber crosswise at center of skid, preventing bending or breaking if moved by rollers or resting on uneven surface.

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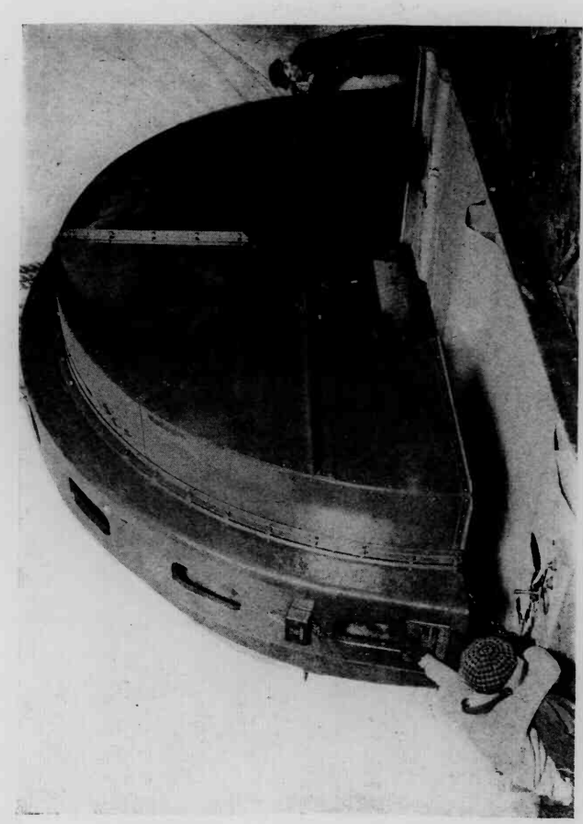

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(18) Casing of Top Half Stationary Armature.

Top half armature with one side and ends of case in place. Note vertical timbers over center on skid and 5 sets of braces equally spaced around piece, engaging the piece in the center. Note also heavy corner posts, double thicknesses of lumber, etc., fully described in text.

The particular species of lumber used in the construction of a box is not as important a matter as has often been supposed. The ultimate strength of a box is much more dependent upon the quality and size of lumber used and the method of nailing and strapping than upon the species used.

The quality of the lumber as regards seasoning and defects is a vital factor. Boxes made of green lumber lose a large part of their strength upon drying out, owing chiefly to the loosening of the nails from the shrinking of the boards. It is absolutely essential that the boards of which the box is made be seasoned down to general atmospheric conditions, or to from 12 to 18 per cent moisture, based on the weight of the wood after oven drying. Improper seasoning is one of the most common faults in export boxes and should be very carefully guarded against. The number of defects in the box boards such as knots, knot holes, season checks, or openings in the grain caused by seasoning and decay is also a matter of much importance, as the strength of the individual boards is dependent in a large measure on the number, size and position of such defects. Large knots, especially when they are unsound or decayed or loose, and large knot holes decrease the strength of the piece, particularly when they are near the middle of the board, and should not be permitted in export boxes. Large checks or splits should not be admitted, unless properly reënforced across the opening with corrugated fasteners, and decayed or rotten lumber should also never be used. No defects should ever be permitted in box boards which interfere with the proper nailing of the box. It is again emphasized that the severe conditions of export shipping demand good containers, and good boxes cannot be made of green lumber or lumber of poor quality.

The size of the lumber used in the box or its thickness and width is of much importance, as this affects both the cost and the strength of the container. The standard commercial thicknesses and widths should wherever pos-

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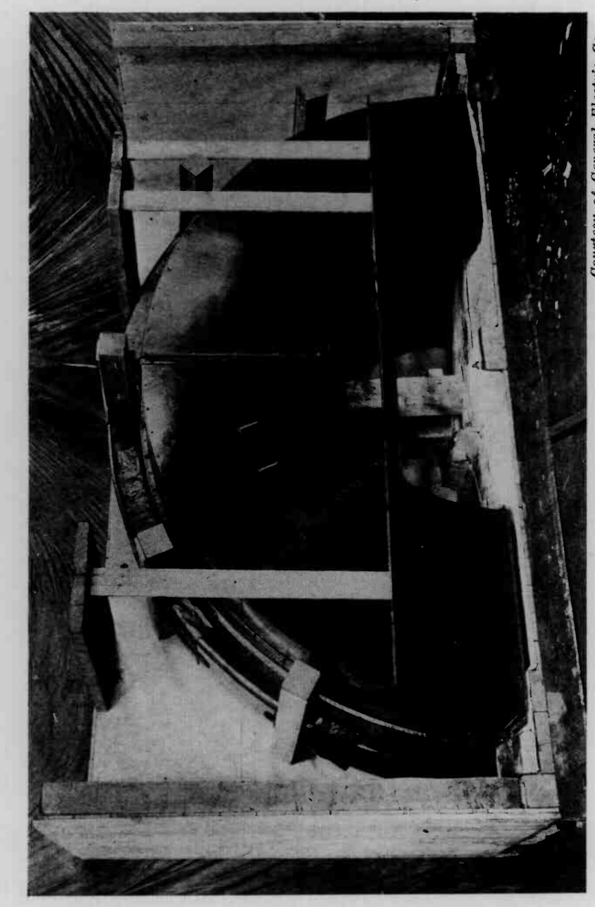

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sible be adhered to, as the use of special sizes not carried in stock by lumber dealers or box factories greatly increases the cost of the box and in most instances accomplishes no particular purpose. By far the larger part of lumber used in box manufacture ranges in width from 4″ to 6″ or 8″ although widths up to 12″ are sometimes available.

Boxes made of wide boards are preferable to boxes made of narrow boards, as they are more rigid, and there is not the danger of the box twisting out of shape by shearing along the joints between boards when it is dropped on a corner of the end. Also the wider the board, the less it will be weakened by a defect of any particular size. As a rule no piece of less than 2 1/2″ face width should be used in any part except the cleats, since pieces narrower than this cannot be properly nailed with two nails at each end, as adequate nailing requires. If pieces as narrow as 2 1/2″ face width are used their number should be limited, and they should be placed in the center of the side, top, bottom or end. The particular thickness of lumber required in a box depends upon the size, character and weight of the contents, so it is impossible to lay down a definite rule in this respect. The contents of some boxes are strong and rigid and offer much support to the side, top, bottom and ends. In this case the element of damage by breaking or puncturing of the box boards is reduced to a minimum, and less thickness is generally required than where the contents offer little or no support and the box is dependent solely on its rigidity for its strength. Boxes of excessive size must generally be of thicker material than small boxes, owing to the increased danger of the breaking of long boards. Also boxes with heavy contents must usually be of thicker material than boxes with light contents. Thinner material may be used in boxes if they are made of hardwoods such as beech, birch, maple, elm, ash, oak or gum because of the greater inherent strength and greater nail holding power of the hardwoods. The ideal box is the box which is of balanced construction, or in which each

part is just strong enough to balance the average strength in every other part. The particular thickness of material necessary to give both this balanced construction and also sufficient strength to carry the contents safely to destination, is a point which will have to be carefully worked out for each product.

Nailing.—The method by which the parts of a box are nailed together determines in a large measure its ultimate strength. Often the addition of a few correctly placed nails will increase the strength over 100 per cent. Improper and inadequate nailing are two of the most common faults in export boxes. The National Association of Box Manufacturers has recently issued a nailing schedule, which is based upon years of tests made by the United States Forest Service and also upon years of practical experience. Adherence to this schedule will insure adequate nailing and will do much toward improving export boxes. The principal woods used in boxes are classed into four groups as follows, depending chiefly upon their physical and mechanical properties with respect to the way they receive and hold nails, and with respect to their strength:

	Group
Alpine Fir	I
Aspen	I
Balsam Fir	I
Basswood	I
Beech	IV
Birch	IV
Black Ash	III
Black Gum	III
Buckeye	I
Butternut	I
Cedar	I
Chestnut	I
Cottonwood	I
Cucumber	I
Cypress	I
Douglas Fir	II
Hackberry	IV
Hemlock	II
Hickory	IV
Jack Pine	I
Larch (Tamarack)	II
Lodgepole Pine	I
Magnolia	I
Maple, Hard	IV
Maple, Soft or Silver	III
Noble Fir	I
Norway Pine	I
Oak	IV
Pumpkin Ash	III
Red Gum	III
Redwood	I
Rock Elm	IV
So. Yellow Pine	II
Spruce	I
Sugar Pine	I
Sycamore	III
Tupelo	III
Va. and Car. Pine	II
Western Yellow Pine	I
White Ash	IV
White Elm	III
White Fir	I
White Pine	I
Willow	I
Yellow Poplar	I

The gauge of nails to be used is determined principally by the thickness and species of the wood in which the *points* of the nails are held after driving. The schedule which follows is based upon standard cement coated box nails.

Use cement coated nails of gauge indicated.	Thickness of Ends or Cleats to which Sides, Tops and Bottoms are nailed								Thickness of Sides to which Top and Bottom are nailed		
When species of wood holding points of nails is:	3/8" or less	7/16"	1/2"	9/16"	5/8"	11/16" or 3/4"	13/16"	7/8"	[1] Less than 1/2"	1/2" to 9/16"	5/8" to 7/8"
GROUP I	4d	5d	5d	6d	7d	8d	8d	9d	4d	6d	7d
GROUP II	4d	4d	5d	5d	6d	7d	7d	8d	4d	5d	6d
GROUP III	3d	4d	4d	5d	5d	6d	7d	7d	3d	4d	5d
GROUP IV	3d	3d	4d	4d	4d	5d	6d	7d	3d	4d	5d

[1]Only in exceptional cases is side nailing recommended when the thickness of sides is less than 1/2".

In export boxes the spacing of the nails should be closer than in domestic boxes, owing to the rougher handling to which they will be subjected. In nailing side, top and bottom to ends six penny nails and nails smaller than six penny, should be spaced not to exceed 1 1/2" apart when driven into the side grain of the box end and not to exceed 1 1/4" apart when driven into the end grain of the end. With nails larger than six penny the spacing should be increased one-fourth inch for each penny over six. In nailing top and bottom to sides, the nails should be spaced six inches or more apart when the nails are six penny or smaller, increasing the spacing 1" for each penny over six. No board should have less than two nails at each nailing end, and on edges where cleats are used the nails should be staggered so that approximately half of them are driven into the cleat and half into the end. Nails with large heads should be used, particularly when the sides, top and bottom are of thin lumber and great care should be taken not to overdrive nails. No nails should be driven into joints between boards.

Cleats on box ends should be firmly nailed to the ends with nails of sufficient length to pass through the cleat and through the end, and clinch not less than one-quarter of an inch. Where the box end is composed of more than one piece each piece should be nailed to each cleat with not less than two nails. The number of nails used to nail the cleat to the end should be approximately the same as the number used to nail the adjacent side, top or bottom to the cleat and end. The nails should be evenly staggered and should be placed as near the edge of the cleat as possible without splitting it.

Strapping.—The metal strapping of export boxes is a matter of the utmost importance. All export boxes no matter what their size, weight or destination should be metal strapped, as properly applied strapping greatly increases their strength and also is of great assistance in preventing pilfering. There are a number of different types of strapping in use, the principal kinds being single wire, twisted wire and flat steel band, applied with nails or staples. Wire and flat band strap are also made so that they can be applied under heavy tension without nails or staples, by the use of patented stretching and sealing devices. Plain flat band unannealed steel strap, coated to prevent rust, makes an excellent binding when properly located on the box and properly stretched and nailed. In most instances the unannealed strap is preferable to the annealed, because it has approximately one-third more tensile strength and is not so likely to stretch or to tear or break. The thickness and width of strap and the number of straps which should be used in any particular case depend upon the size, gross weight, shape and construction of the box and the character of the contents. Very long boxes may require several straps, one at each end and one or more equally spaced between the end straps. Where the boards on the top and bottom of the box are run crossways or with the grain parallel to the box end, the box should be strapped two ways: i. e. one strap around each end parallel to the ends and one strap around the box on each side parallel to the sides.

Boxes of large size or heavy gross weight require a heavier, stronger strap than boxes of small size or light gross weight. In general a strap 1/2″ wide by .018″ in thickness should be satisfactory for boxes up to 100 lbs. gross weight, while boxes over 100 lbs. gross weight should as a rule have a stronger strap—5/8″ wide by .020″ in thickness, or 3/4″ wide by .015″ in thickness, having a tensile strength of about 1,200 lbs. These are only general instructions and may have to be deviated from in particular cases. The character of the contents of the box also affects the size and number of straps necessary. When the contents are of very high value, or where because of the nature of the contents it is necessary that the box be very rigid, it may be necessary to use stronger straps and to place a number of different straps on the box. The two common methods of locating the strap are directly over the box ends and in a slight distance from the end. Nailless strap and wire are always applied in from the box end, being drawn to heavy tension by the use of a stretching device, and the ends sealed in some manner. No matter at what point the strapping is applied it is of the utmost importance that it be drawn to maximum tightness before nailing. Loosely applied strap loses much of its value as a binding, and the shrinking of the box as it drys out will make it loosen up even more, causing it to bulge between the nails and form festoons which are very liable to catch and tear on every projection which the box encounters in handling. It may safely be said that improper stretching before nailing causes more failure of strapping from breaking, tearing or pulling off the box, than any other one factor. The strap should be very securely nailed, especially where it passes over the corners of the box or where the side, top and bottom of the box meet. Between the box corners it should be nailed at frequent intervals, as a rule every 3 or 4 inches, to keep it tight against the box surface and minimize festooning. It is also a good plan with nailless strap or wire, to fasten it with nails or staples at each of the four corners to prevent it from

slipping off when the box shrinks and the strap loosens.

Marking.—The marking of a package with shipping directions and other necessary information, is as important as the packing and should be completely and carefully done, as improper marking may result in the loss of the package or in the imposition of heavy fines in the country of destination because the markings are not in accordance with the country's regulations.

The marks on the package should agree absolutely with those on the invoice and bill of lading. Wherever possible the markings should be stencilled on the package with black waterproof stencil paint, or where the article or package is of a dark color, with white paint. Stencilled markings are preferred to hand markings because they are clearer and generally occupy less space. All characters should be large enough so that they are plainly visible, in general not less than 2″ high and larger on packages of large size. As a rule the complete markings should appear on two faces of the package. Care should be taken that the markings are dry before handling the package.

The use of tags should be avoided as much as possible because they are very liable to tear off or become defaced so that they are illegible. Where, because of the nature of the package, their use is necessary, they should be metal and should be firmly wired to the package. Labels are also objectionable because they are liable to be loosened by moisture or become defaced.

The name of the consignee and the destination of the package with its routing should be marked in the most prominent place and in the largest letters, preferably in the middle of the face of the package as these markings are the most important. Other required markings such as the gross weight, tare weight, net weight, cubic displacement or serial numbers, should preferably be in the corners of the face of the package.

It is always well to place a duplicate set of markings inside the package as a means of identifying it, should by any means the markings on the outside become defaced.

It is also well to place a packing list inside, enumerating the kind and number of items making up the contents as an aid in tracing loss. Marks such as "This Side Up" or "Handle With Care" do not do much good unless written in the language of the country of destination. Advertising and other unrequired marks should be omitted as much as possible, because the presence of unnecessary markings is liable to cause confusion or mistakes in interpreting the necessary markings. No old markings of any kind should ever appear on packages.

Care in Packing and Special Protection.—The method of packing the contents in a container demands as careful attention as the construction of the container itself. Frequently the container is adequately constructed and arrives at destination in good condition, but the contents are damaged because they were improperly packed.

The contents of the package should be very firmly and compactly packed, articles of irregular shape being nested together so that they occupy the least possible space. Loose packing of the contents, particularly in boxes and crates, may also seriously affect the strength of the container, since with the jars and vibrations of transportation the loose articles act as a hammer and loosen the nails and fastenings. Machinery, vehicles and other commodities which occupy an excess of space when packed assembled, should be disassembled before packing.

Articles of a fragile nature should be separated from each other and from the container with partitions, racks, braces or cushioning material, so that the shocks of transportation will be absorbed and not produce breakage.

Internal Packing Material.—Regarding the use of internal packing material, this is a rather difficult subject to treat, as the packing material which should be used depends entirely upon the contents of the container. Excelsior is a material which is used to a great extent for cushioning purposes, to separate breakable articles from each other and from the walls of the container. Excelsior differs considerably in its cushioning properties, some excelsiors being much more springy than others. Excelsior is well suited for many packing purposes where cushioning material is needed, but there are also places where it should be used with limitations. Some shippers of aluminum-ware claim that excelsior, which is wet or damp, makes a bad packing material, as it is liable to injure the aluminum during export shipment. For packing purposes excelsior should always be dry, that is, have approximately the same moisture content as the air. This is especially necessary where it is used as a cushioning material for furniture and other finished wood surfaces. Where it is used in connection with a highly polished wood surface, the wood should first be covered with a flannel or very soft material so that the excelsior will not produce scratching. Considerable highly polished mahogany furniture is often damaged by placing the excelsior directly on the furniture, especially if it is somewhat damp.

Crumpled paper is considerably used for a cushioning material, and is excellent for this purpose. Bogus paper is considerably used for this purpose because of its soft character and cheap cost. Straw is also used to a considerable extent, but for certain purposes the straw is objectionable because it is liable to break up easily into small pieces, especially if old straw is used. Corrugated straw boards are also much used, especially for wraps around bottles, and make a very efficient cushioning material. Straw board is also used for partitions between bottles, and in some cases makes a better material than wood partitions, because it has more resistance than the wood and does not break off the way the wood does. Hair felt is often used as a cushioning material for wrapping around highly finished metal surfaces, to prevent them from scratching, and also to form a cushioning material to minimize the shocks and jars of transportation, especially in the case of delicate instruments. Wooden partitions and wooden cleats, properly placed in a box, can often be substituted in place of excelsior with considerable saving of space. One large electrical concern recently substituted such partitions and cleats

in place of excelsior, for packing insulators, with a great saving in space and saving in cost of packing, and these cleats offered just as good protection as the excelsior. Cast-iron articles must be very carefully protected against the shocks and jars of transportation or they are very liable to be broken. Cast-iron stoves are one of the most difficult articles to export, because of the fact that they break very easily from the jars of shipment. Where several cast-iron articles are packed in the same container, they should be separated from each other by soft wood cleats and should be protected by plenty of cushioning material.

Waterproofing.—Protection from damage by water, moisture, or dampness is very necessary in the export shipment of many kinds of goods. The package may be exposed to rain in loading or unloading from the ship or in carting across the city. It is subjected to more or less dampness in the ship's hold. Wet packages may be piled on top of it during transportation or storage. If it is unloaded from the ship into lighters it may receive drenching dashes of sea spray. If it is destined for a damp, tropical climate it may encounter torrential rains and excessively humid atmosphere.

Machinery, hardware, vehicles, furniture, musical instruments, textiles, clothing, leather and leather goods, books, stationery, certain food products and chemicals are some of the more important products which require waterproof protection.

Iron and steel parts subject to damage by rust should be coated with a good anti-rust compound, which is thick enough under ordinary temperatures to adhere well and not drop off or rub off. It should contain no grit, acid or other injurious substance and should be of such a character that it can be removed without too much difficulty.

Lining.—All boxes and crates containing material subject to damage by water or moisture should be lined with a thoroughly waterproof paper. The standard case and crate lining paper used by the War Department and also by many different industries, is a duplex waterproof

paper made of two 30-lb. sheets of No. 1 sulphate kraft basis 24″ x 36″—480 cemented together with asphaltum. This paper is absolutely waterproof, is of just the right strength for a case or crate lining material and is of the right weight to handle well. The waterproof coating is between the two sheets, out of sight and out of touch, where it cannot scrape off. The paper can also be folded without breaking the waterproof coating, which is an important requisite in a case or crate lining paper. Duplex papers may also be had in heavier weights where extra strength is desired, such as combinations of two 40, two 50 or two 60-lb. papers.

Another paper which is much used where it is desired to wrap the article itself or part of it, is a paper made of one sheet of sulphate kraft coated with asphaltum and reënforced with cotton cloth of various mesh. This paper can be had in various weights from a 30-lb. to an 80-lb. sheet, and reënforced with a cotton cloth varying from 8 to 40 threads to the inch each way. Cloth reënforced paper is much used in places where strength and resistance to tear or puncture is desired, such as a wrap for parts of engines, for electrical apparatus, for parts of vehicles and for bundles. By tying the paper securely with cord and asphalting all joints, a perfectly watertight wrap can be made around an article of irregular shape such as an engine part. Cloth reënforced paper is also used to line cases and crates, where the nature of the contents or the method of the construction of the package demands a paper of extra strength.

Other waterproof papers much used are a kraft paper coated with asphaltum and reënforced with burlap, and a paper made of two sheets of kraft cemented together with asphaltum and reënforced between the two sheets with parallel cords. The burlap reënforced paper is much used where a strictly waterproof paper of great strength and resistance to abrasion is required. Because of their tensile strength and resistance to tearing across the cords, the cord reënforced papers are much used in narrow widths to spirally wrap material in coils or rolls.

Some articles which are very hygroscopic or extremely liable to damage by water or humid atmosphere, are packed in metal lined, hermetically sealed containers.

Crate Construction.—A wooden crate consists of a frame with or without bracing. It may also be entirely closed or sheathed over similar to a box. Completely closed crates are often called cases.

The construction of crates has not been standardized as has the construction of boxes, because the method of their construction is dependent in a large measure on the size, shape and weight of the article which is being crated. Crates are, from the nature of their construction, vitally dependent upon the method of joining and fastening the crate members together.

For articles of large size and weight crates are generally more economical than boxes, because the box will have to be made throughout of lumber of excessive thickness to give the required strength, while in the crate the required strength can be secured in the frame and braces, which can be covered with thin sheathing if necessary.

In general the same remarks regarding the quality of lumber used in boxes apply also to crates. In the crate frame and braces, however, it is very important that strictly sound first quality lumber be used, free from any defects which impair its strength. The War Department specifications for crating limit the size of knots in frame and braces to one-fourth the width of the piece in which they occur.

As in the case of boxes, the particular species of lumber which is used is not a matter of as much importance as that the lumber be of proper quality, proper thickness and properly joined and fastened in the crate. Practically any of the commercially important woods will make satisfactory crates. The standard commercial thicknesses and widths should be adhered to wherever possible. Except in the case of small light crates, the width of frame members or braces should not be less than three inches, as it is difficult to properly nail or bolt pieces narrower than this. The sheathing or covering

material should not be less than 2 1/2″ face width. The particular thickness of lumber to be used in the frame and braces depends upon the size, weight and shape of the article which is being crated, so no definite instructions can be given on this point. When hardwoods such as beech, birch, maple, elm, ash, oak or gum are used for frame and braces, the thickness of lumber required may roughly be 25 per cent less than when the soft woods are used, owing to the greater inherent strength of the hardwoods and their greater holding power for fastenings. In selecting the size of the lumber for use in the frame and braces it should be borne in mind that crates, especially those of large size carrying heavy weights, are subjected to many strains in handling during shipment, and from the nature of crate construction the individual members, even in well constructed, well braced crates, are often required to bear a considerable proportion of the gross weight of the package. The crate should be so constructed and the size of the frame members should be such, that wherever possible the package will ride safely on side, top, bottom or end.

Bolting and Nailing.—The method of nailing or bolting the members of a crate together is even more important than the method of nailing the parts of a box together. The bolting or nailing surface in crates is much smaller than in boxes, and much of the strength of the crate depends upon the efficiency of the fastenings, particularly those at each of the eight corner joints. Both nails and bolts are used as fastenings, the nails as a rule being used for crates of thin material—2″ and under. All nails of size 20 penny and under should be standard cement coated box nails, as the cement coated nails have from 10 to 30 per cent more holding power, and because of their thinner gauge cause less splitting in driving. In frames and frame braces the length of the nail should be not less than twice the thickness of the member to be nailed on, or the piece through which the nail first passes. Frames and braces should have not less than two nails in each nailing edge—more nails being used in the wide

pieces. Where the piece receiving the point of the nails is of sufficient thickness, the nails through frame pieces and braces should be staggered. Crossed braces should have not less than two nails driven through both braces where they cross, and these nails should be clinched where possible. The nails used in the sheathing or covering material should generally be 2 penny larger than the thickness of the sheathing expressed in eighths of an inch, and the nails should be driven in a staggered row where possible, approximately 2½″ apart. Where bolts are used for fastening frame pieces and braces they should be carriage bolts in preference to machine bolts. Standard cut washers should be used under bolt heads and nuts except under the heads of carriage bolts. The holes for the bolts should be bored to the same diameter as the bolts or a fraction smaller. In frames from 1 to 1½″ in thickness ⅜″ bolts should be used, in frames up to 3″ in thickness ½″ bolts, and in frames over 3″ in thickness ⅝″ bolts. To prevent the nuts from working loose the threads below the nut should be upset. Not less than two bolts should be used in each framing edge, and the bolts should be staggered where possible.

Joining and Bracing.—Much of the strength and efficiency of the crate depends upon the way the members are joined together, and the way the contents are braced in the crate. Economy of space should always be in mind in crate construction. The corner joints should be so made and the braces so placed that the displacement of the crate is as small as possible. The "Three Way Corner" joint should be used on each of the eight corners wherever possible, as this joint occupies the least amount of space—only one thickness of lumber intervening between the contents and the outside surface of the crate. In this joint the three frame members entering into it—the side member, the end member and the top or bottom member—are joined so that each piece is held by nails or bolts driven from two directions, and all nailing, if nails are used, is into the side grain of the wood, which gives maximum holding power. (Diagram 1, fig. 1, page

68, illustrates the most efficient and most used type of three way corner joint. Figures 2 and 3 illustrate two more of the seven possible joinings of the three members to give this corner.)

Large crates and crates with heavy contents should always be diagonally braced, and braces should be placed so that they are as near a 45° angle as possible. Where the panel to be braced is long compared to its width it may be necessary to use one or more cross members to bring the diagonal braces at or near a 45° angle.

The following rule, which I quote from a pamphlet written by me, and published by the Safepack Mills, indicates the spacing of the cross members, and the number of panels of bracing: "Divide the longer dimension of the side or end to be braced by the shorter dimension, then—

(a) If the result is less than 1½, use one angular or crossed brace (see Diagram 2, page 68), $6 \div 6 = 1$.

(b) If the result is 1½ or more and less than 3, use a cross member and two angular or crossed braces (see Diagram 3, page 69), $8 \div 3.7 = 2.1$. Use a cross member and two angular braces or a cross member and two crossed braces.

(c) If the result is 3 or greater, use a number of angular or cross braces equal to the first figure of the result and cross members to correspond, thus (see Diagram 4, page 70), $14 \div 3 = 4.6$. Use four crossed braces (or four angular braces) and three cross members.

"Braces are made both with single mitred ends and with double mitred ends (see Diag. 2). The single mitred end brace is much used on light crates of thin frame material. In the single mitred end brace, most of the stress in the brace must be taken by the fastenings in the end because the surface 'ab' (Diagram 2, fig. 1) has no bearing on the crate frame. In the double mitred end

brace, the end is so cut that the 'toe' of the brace 'bc' (Diagram 2, fig. 2) bears against the upright frame, thus taking some of the stress off of the fastenings in the brace and transmitting it directly to the frame. In the double mitred end brace, the 'heel' of the brace or the distance 'ac' (Diagram 2, fig. 2) should be cut longer than the 'toe' 'bc' as shown, so as to afford as much nailing or bolting surface as possible.

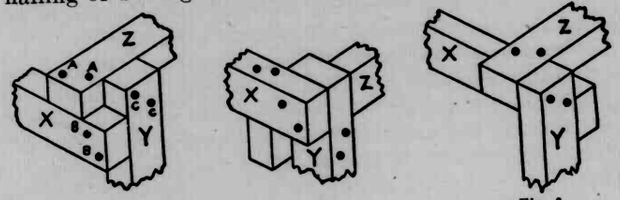


Fig. 1 Fig. 2 Fig. 3

Courtesy of Safepack Mills.

Diagram 1

"When crossed braces are used as shown on Diagram, 2, fig. 2, it is necessary to place a fill piece 'x' of same thickness as the under brace, beneath the ends of the outside brace so as to make a flush nailing or bolting surface. These pieces should be securely nailed to the frame.

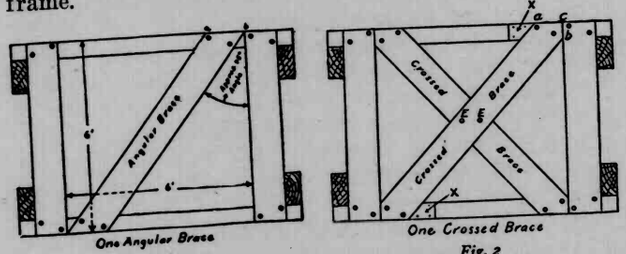


Fig. 1 Fig. 2

Courtesy of Safepack Mills.

Diagram 2

"As far as possible the combined thickness of braces or of braces and sheathing, should not exceed the thickness of the frame members, so as not to project beyond the crate frame and increase the displacement of the

crate (see Diag. 5). The thickness of the sheathing 'S,' plus the thickness of the braces 'B,' equals the thickness of the frame member 'M.'

"When sheathing is used, diagonal braces are often placed outside the sheathing, as shown on Diag. 5, in which case one of the braces is usually divided when crossed braces are used, as shown."

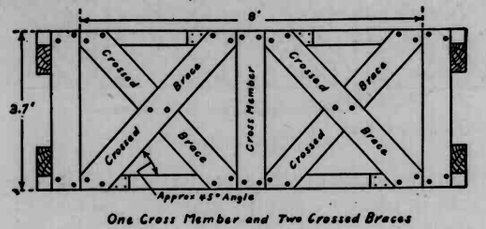


Fig. 1

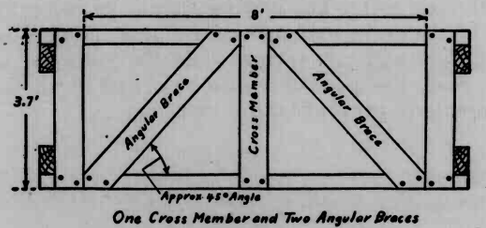


Fig. 2

Courtesy of Safepack Mills.

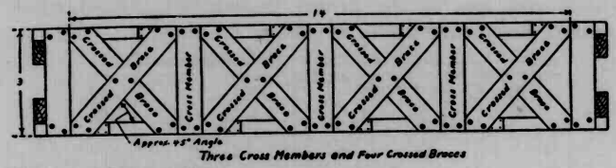
Diagram 3

With heavy articles the skids, or horizontal frame members upon which the load rests, should be at least 50 per cent thicker than the other frame members, the additional thickness preferably being in a separate piece nailed or bolted to the skids. The ends of the skids should always be chamfered or beveled.

It is very important that the contents of the crate be firmly anchored to the skids with bolts or clamps, and also firmly braced against lateral or longitudinal movement. To quote again from the pamphlet mentioned:

"When the contents has base holes it should be bolted

securely to the skids or to cross members in turn securely bolted to the skids. Large washers should be used under bolt heads and under nuts, and either the threads on the bolt ends should be upset or lock nuts should be used to prevent nuts from working loose.

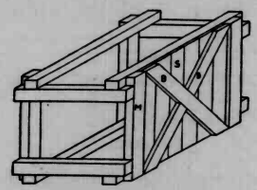


Three Cross Members and Four Crossed Braces

Courtesy of Safepack Mills.

Diagram 4

"When the contents has no base holes it should be firmly held in place by clamps placed at each end or side, fitted snugly to the load and held in place by one or more bolts at each end. The clamps should be full width or length of the crate, and sufficiently large in cross section so that they will not spring when the bolts are drawn home. Such clamps should also be placed on the side of the contents to prevent lateral movement.



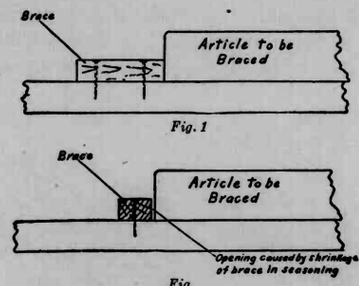
Courtesy of Safepack Mills.

Diagram 5

"Internal wooden cleats or braces should, as far as possible, be placed so that the thrust will be taken by the end grain of the piece, not by the side grain. The shrinkage of wood along the grain is practically negligible, and cleats or braces placed so that the compression stress is against the end grain. as shown in Diagram 6, fig. 1, will not loosen when the pieces shrink during seasoning. When cleats or braces are placed so that the compression

stress is against the side grain they are very apt to loosen, as shown in Diagram 6, fig. 2, especially if the wood is not well seasoned.

"On crates with heavy contents, it is often advisable to use additional vertical braces at the corners. These braces support the horizontal members and take some of the stress off the corner fastenings. Diag. 7 shows such vertical braces; piece 'X' is a light brace and piece 'Y' is a heavy brace used where extra strong support is desired.



Courtesy of Safepack Mills.

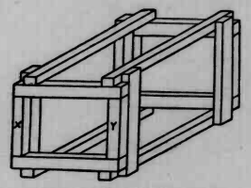
Diagram 6

"Vertical center braces are often used on crates with heavy contents. These braces are usually the same thickness as the vertical end members. See Diag. 8. The cross member 'CM' and the scabbing 'S,' Diagram No. 9, serve the same purpose as the vertical center brace in Diagram 8.

"In crates with heavy contents it is often necessary to use skid beams placed crossways on top of the skids to support the load. Also the shape of the contents often necessitates the use of skid beams, where it is impossible to bolt or anchor directly to the skids. Such members are shown in Diag. 9, marked 'SB.' Enough skid beams should be used to distribute the load as evenly as possible along the skid.

"Scabbing is a tie piece used to tie two crate members together to keep them from spreading. Long crates

should have scabbing at each vertical cross member. Diag. 9 shows scabbing marked 'S.' The scabbing should be placed on the inside of the members tied together, and should be wide enough to cover the heel of the diagonal braces as shown. When it is not possible, because of the shape of the contents of the crate, to place the scabbing on the inside of the members which it ties together, and when placing it on the outside of these members increases the displacement of the crate, tie rods should be used in place of scabbing. These tie rods should be run from the bottom of the skid through and engaging the top member. It is often necessary to use scabbing on the crate bottom to tie the skids together as shown in Diag. 10.



Courtesy of Safepack Mills.

Diagram 7

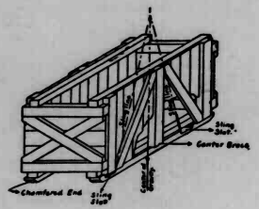


Diagram 8

"In addition to diagonally bracing the sides and ends of a crate, it is often advisable to brace the top diagonally. Diagram No. 11 shows the top of a crate with sheathing, diagonal crossed braces on top of sheathing and battens 'X' below sheathing to reënforce it, where extra wide spaces occur. Diag. 9 also shows diagonal braces on the crate top, marked 'TB.' "

On heavy crates the skids should be slotted for the sling cable used in loading, the slots being far enough apart to admit of proper handling and so located that the load balances properly. Most crates should be metal-strapped, particularly at the corner joints and over sheathing when it is used. The strapping should be flat band unannealed steel, coated to prevent rust, and should be very tightly stretched and nailed.

Use of Screws in Boxes and Crates.—Regarding the use of screws in boxes and crates, this is often advisable, especially in the case of boxes when it is desired to use the box over again, and in crates when it is desired to

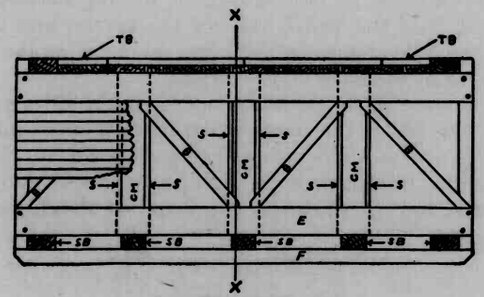
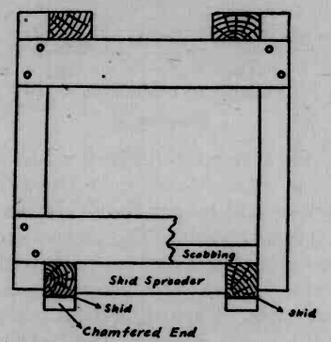


Diagram 9



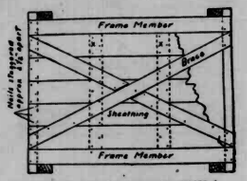
Courtesy of Safepack Mills.

Diagram 10

make the crate so that it can be easily gotten into for the inspection of customs officials, without tearing the boards all to pieces in getting them off. We will first take up the use of screws in boxes. When it is desired to get into a box without tearing the boards to pieces, the top boards are often attached to the sides and ends and to the cleats

with screws in place of nails. It is usually necessary to bore the first board through which the screw passes to avoid splitting it, and the diameter of the hole should be equal to the diameter of the shank of the screw. When the box is made of hardwood it is usually necessary to drill the hole the full length of the screw, and in this event the hole should be the same diameter as the screw measured at the base of the thread.

Where the thickness of the boards in the sides and end of the box and in the cleats is not more than an inch, the size of the screws which should be used is No. 10, 11 or 12. Where the thickness is ⅝", No. 8 or No. 9 should be used, and for ½" thickness No. 7 screws should be used.

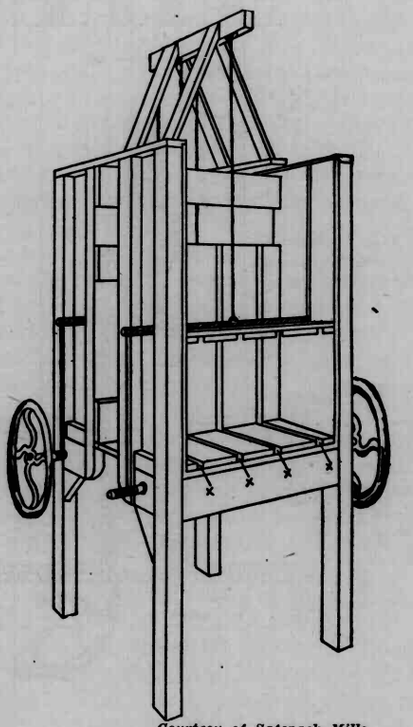


Courtesy of Safepack Mills.

Diagram 11

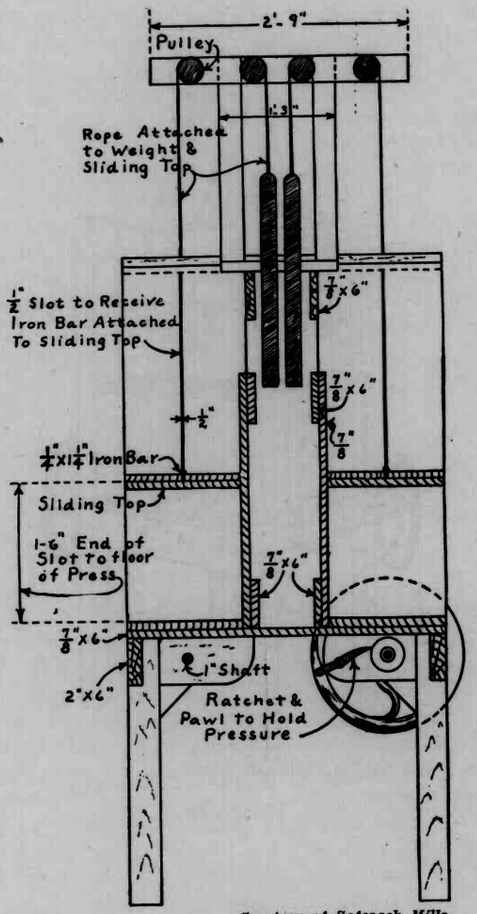
The length of the screw should be not less than twice the thickness of the first board through which the screw passes. If screws still longer than this can be used without splitting, it is advisable. The screws should be spaced about the same distance apart as with nails, or possibly a little bit farther apart, as the screws make a stronger fastening than nails. Care should be taken not to drive any screws into joints between the boards, and screws should be placed far enough from the joint to prevent splitting into it. It is also very important not to drive the screws with a hammer, as is often done. The holding power of the screw is greatly diminished by driving it with a hammer, as the wood structure around the threads is destroyed.

Regarding the use of screws on crates, they are often used on a few of the boards, either on the sheathing or



Courtesy of Safepack Mills.

Diagram 12



Courtesy of Safepack Mills.

Diagram 14

on some of the other members to enable getting into the crate for inspection, without tearing the boards all to pieces in getting them off. In export crates this is often advisable so that the customs officials can open the crate easily for inspection purposes. The screws should be spaced approximately the same as the nails, and should be of a length not less than twice the thickness of the first board through which the screw passes. Where the thickness of the first board is around an inch, the size of the screw should be No. 10, 11 or 12. For material thicker than this, larger screws will have to be used, the size depending upon the thickness of the material. Where the material is over 2" thick, the use of screws is not recommended, and the use of bolts would be preferable. As in the case of boxes, no screws should be driven into joints, and screws should never be hammer driven.

The Possibilities of Baling.—The packing of textile materials in machine pressed bales offers great possibilities to the exporter, from the standpoint of the reduced displacement of the package. Reducing the displacement generally means a saving in packing costs, saving in handling charges, saving in freight and a saving in storage charges. Baling also means a great saving in import duty, where the duty is levied on the gross weight of the package.

The average saving in space by packing in machine pressed bales in place of in boxes, is around 30 per cent in the gross displacement of the package. This is a very large item where the ocean freight charges are based on space occupied. The War Department states in one official bulletin that over $50,000,000 was saved during the war by baling various textile articles instead of packing in boxes, most of this saving being in the value of the ship space saved. The experience of the War Department shows that a great variety of textile materials can be baled, including underwear, hosiery, sweaters, gloves, coats, trousers, towels, blankets, tarpaulins, tents, bedding, cloth and many other articles. It was even found possible to successfully bale high grade officers' uniforms

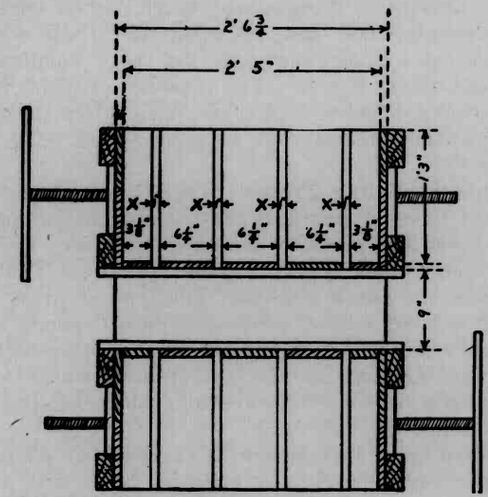
without injury from the compression, by carefully folding and tying the garments along the proper lines.

The Successful Bale.—Successful baling, especially of small articles, depends largely upon the making of firm compact bales. This can be accomplished with small articles by careful folding and tying into small bundles, and bricking these bundles up into a compact bale with the joints between bundles broken. The New York Quartermaster Depot used a "Forming Box" for this purpose with great success. This consists of a box with a head or top which can be compressed and with an open front. The rectangular opening of the box is of the size which it is desired to make the bale. After the articles have been folded and tied in bundles, they are bricked up into the shape of the bale in the forming box. The contents are then compressed as much as possible and tied with strong cord at several places to hold the compression. The package is then removed and transferred to the baling press, where the final compression is secured and the waterproof lining, burlap and steel strapping applied. The use of the forming box makes the forming of the articles into the bale an entirely separate operation, and releases the baling machine for the compression service only, thus greatly increasing the output of the machine.

Use of the Forming Box.—I quote the following description of the mechanism and use of the forming box and baling press, from a pamphlet written by me and issued by the Safepack Mills:

"The forming box shown here is double and was designed by the New York Quartermaster Depot for the army size of bale, 30" x 15" x 14" to 19". Essentially it is a wooden box with open front and a top shelf, that can be pulled down by means of a hand wheel to tighten the bundles or pieces into a compact package of the proper size ready for compressing in the baling press.

"The inside dimensions of the box are, length 29", width 15" and height 36". There are four slots 'x' (Diagrams 12 and 13) for the four cords used to tie the package while it is under compression. There is also a ratchet and pawl (Diagram 14) on the end of the hand wheel shaft, to hold the compression on the package while it is being tied. The four strings used to tie the package are removed when the package is in the baling press and are used over again."



Courtesy of Safepack Mills.

Diagram 13

Use of the Baling Press.—"After preliminary pressing and tying in the forming box, the package is removed to the baling press for the final compression. A piece of burlap and a sheet of waterproof lining material are placed on the base of the press, and the package is placed upon them. Another sheet of waterproof lining material and a piece of burlap are then placed on top of the bale. (If the press is the closed type it is necessary to fold or roll back the ends of the burlap and waterproof lining

which project beyond the sides and ends of the bale, so that they will not be injured during the compressing.) The pressure is then applied, and upon completion the waterproof lining and burlap are folded over on the sides so that they lap perfectly. The bale is then bound with straps and the straps sealed. The pressure is then released and the bale removed from the press for sewing."

The amount of compression which can be secured in any particular case depends upon the article which is being baled. Some materials are very compressible, while others are less so. The presence of metal fastenings, eyelets, buckles, hooks, etc., also affect the degree to which the material can be compressed. To quote again:

Types of Baling Press.—"There are a number of different types of baling presses in use, including hand lever operated presses, electrical presses, hydraulic presses and other types of power presses. There are also open and closed presses. The type of press which should be used in any particular case depends chiefly upon the size of the baling operation, the space available in the packing room and the type of goods which is being baled; therefore, no definite recommendation can be given on this point.

"For a small operation with an output of around 100 bales per day, a hand lever operated press with a large enough chamber to make two bales at one time, is generally satisfactory. On the other hand, for a large operation where the output is several hundred bales per day, a mechanical power press making two or four bales at one time will prove more economical. The New York Quartermaster Depot, which during the war was probably the largest baling operation in the country, used a number of electrically operated closed presses, each press making four bales at one time. In an economical baling operation the presses should be kept busy all the time, and this should be borne in mind in selecting the type of press and in deciding upon the number of presses which are required. The press should be capable of compressing the bale to maximum density and should have a maximum pressure of not less than 20 tons.

"There is considerable difference of opinion as to the relative merits of open and closed presses. Some army experts maintain that the closed press is better; they claim that it makes more rectangular, uniform sized bales. Others maintain that the open press is better because it is easier to get at all sides of the bale while it is under compression; and also because it is easier to handle the waterproof lining and burlap covering."

Size of Bale.—The War Department adopted a standard size of bale, namely, 30″ long, 15″ wide and with a height varying from 14 to 19 inches. The average weight of the bale was 70 to 140 lbs. This is a considerably smaller bale than is generally used commercially, but it has advantages over the larger bale. It is twice as long as it is wide, which makes it a good shape for storage, because they can be stacked up both lengthwise and crosswise and make an even pile. It is of a size and weight which can be conveniently handled by either one or two men, minimizing the desire or tendency to use hooks, which there would be with the larger, heavier bale. It is of a convenient size to make, being easily and quickly handled into and out of the baling machine.

Outside Covering.—Every bale should have a waterproof lining beneath the outside covering. This is taken up in detail under "Waterproofing." The material which is generally used for the outside covering is burlap, because of its strong binding qualities, its resistance to abrasion, and its comparative cheapness compared to other materials possessing equal qualities. The weight of the burlap should never be less than 10-ounce 40-inch basis, as the lighter burlaps do not have sufficient strength. Second-hand burlap should never be used as a covering for export bales unless it is in very good condition.

Binding.—Flat steel band strapping makes a better binding for bales, especially bales of textile materials, than either rope or wire ties. When rope is used, con-

siderable of the compression is lost upon releasing the compression of the baling machine, owing to the stretching of the rope. Also a bale bound with rope is easy to pilfer. Wire ties are not as strong as steel band, do not hold the bale as rigid owing to the smaller surface in contact with the bale, and are liable to produce cutting of the covering material unless slats are used between the wire and the burlap. Steel band should always be coated to prevent rust, and should be unannealed, as the unannealed strap is stronger than the annealed and will not stretch. The thickness and width of strap required depend on the size and weight of the bale. For bales not exceeding 140 lbs. gross weight and not of excessive size, a ⅝" No. 26 gauge strap having a tensile strength of not less than 850 lbs. is satisfactory. The straps should be placed at frequent enough intervals to hold the compression. On the War Department bales 4 bands were used on a bale 30" long, the outside bands being not less than 4" in from the ends, and the other two spaced equidistant from the end bands and from each other. The straps should be stretched to maximum tension with a mechanical stretching tool while the bale is under compression, and the ends should be securely sealed with a buckle or other seal which will give a strong sealed joint. Care should be taken to break off or fold under all loose ends of strap so that no spider is left projecting.

After the bale has been strapped and removed from the baling machine, the burlap should be sewed up sides and ends with strong baling twine. Each stitch should be knotted and all ends of the twine should be securely fastened. Surplus burlap should be gathered together at each of the corners and sewed into ears not less than five inches in length. The ears serve as handles and reduce the tendency to handle the bale with hooks.

Protection Against Hooks.—The danger of damage by hooks is one of the reasons why baling has not been adopted to a greater extent in packing textile materials.

About the only protection against hooks is to line the bale beneath the burlap with heavy fibre board, testing,

say, not less than 200 lbs. to the square inch, Mullen Test. Thin strips of lumber and veneer are also sometimes used. Another precaution sometimes taken is to stencil on the bale in large letters, "Use no hooks." It is doubtful, however, that marking the bale in this manner helps very much, as many stevedores either cannot read or do not have time to read directions, and the words are likely to be unintelligible when the bale arrives in a country where English is not spoken. As explained in preceding paragraphs, placing ears on the corners of a bale also reduces the tendency to use hooks, as the bale can be easily handled by means of these ears. Another point which has been brought out is that if the size of bale is kept down to around 140 lbs., gross weight, there is not the tendency to use hooks that there is in the larger bale. Of course insurance may be taken out covering damage from hooks.

Waterproofing.—Bales containing textile materials are always lined beneath the outside covering of burlap with a waterproof covering of some sort. There are several materials which are used for this purpose, among them being waterproof tarpaulins, oilcloth, rubberized fabrics of various kinds and waterproof paper. Tarpaulins, rubberized fabrics and oilcloth are very strong and waterproof, but are also very expensive.

Recent developments in the manufacture of waterproof paper have produced papers which make satisfactory bale lining for many kinds of material. Among them is an expansive paper which has been much used by the War Department for lining bales of clothing, this paper having a stretch of 30 per cent in length and 6 to 12 per cent in width of the sheet. The ability of a bale lining paper to stretch is valuable, because there is considerable expansion of the bale between the bands when the pressure of the baling press is released, and the expansive paper absorbs this bulge without breaking. This expansion is greater in the height than in the width of the bale, so it is necessary that the paper have the greater expansion in the length of the sheet. The weight of paper gen-

erally used is one 60-lb. sheet, basis 24″ x 36″—480, saturated with a waterproof compound, or two 30-lb. sheets cemented together with a waterproof compound. Various waterproof compounds have been used, including wax and asphaltum. The compound which is used, however, should be capable of rendering the sheet thoroughly waterproof, and should not be of a character which will penetrate through the paper and stain the contents of the bale.

Two sheets are generally used, one over the top and one over the bottom of the bale, and they should be of sufficient length and width to lap several inches on the sides and ends. Bales containing very valuable material or material very susceptible to damage, are often lined with 4 or even 6 sheets to insure perfect protection.

CHAPTER IV

PRACTICAL NOTES ON EXPORT SHIPPING

By M. C. Fitz Gerald,

Manager of Transportation, General Electric Company.

IN the belief that some of our brother manufacturers may find interest and perhaps value in some of the practical methods which we have adopted and standardized for the packing and shipping of electrical apparatus and supplies, I here present some principles to be observed in connection with the construction of the containers, their markings and the arrangement of the materials inside the containers.

The General Electric Company operates on the principle that "The order has not been completed until the customer is satisfied."

We have tried to place ourselves in the position of the customer or consignee. We have studied the conditions of transportation, in at least three ways: first, as reported by our agents and customers—second, as reported by the United States Consuls both to Washington as well as direct to ourselves, and third, by the reports of our construction men and commercial men who are traveling the four quarters of the globe.

The result of these studies has forced us to the conclusion that the two principal features in successful export shipping are the container and its markings. They are of about equal importance and to slight either one of these is likely to disappoint our good customers. Between factory and destination many things can happen unless proper provisions are made; and either a faulty

container or inadequate markings may result in the following:

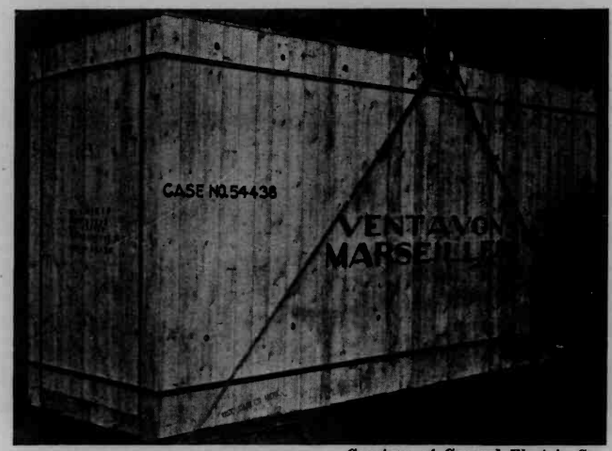
1—Refusal by the steamship company to accept the shipment,
2—The destruction or loss of material in the cargo aboard ship,
3—The destruction or loss of material between ship and shore,
4—Accident or loss while lying on the piers,
5—Accident or loss while traveling inland to point of destination.

In getting material safely into the hands of the customer regardless of exposure, rough handling and delays and regardless of the different languages spoken by the employees of the carrying companies en route, we feel we have been quite successful. The following notes represent good average procedure.

Containers.—In determining the size and weight of containers for miscellaneous shipping, we try to adhere as closely as possible to a maximum gross weight of 300 lbs. and a maximum measurement of 2′ x 2′ x 3′. In both domestic as well as export shipping, less difficulties are encountered with the above size and weight. However, there are, of course, a great many pieces of apparatus of much heavier weight and requiring much larger cases. Note, for example, reproduction of photograph No. 19, page 87. The gross weight of this case is 37,410 pounds, the net weight 31,200 pounds. The case measures 113 inches by 73 inches by 217 inches. As to details of container construction, valuable data have been compiled by the United States Forest Products Laboratory at Madison, Wisconsin, and the War Department.[1]

In no particular do the reproductions of photographs which accompany this chapter require more careful observation and study than in the evidence of the great care which has been taken so to strengthen the boxes as

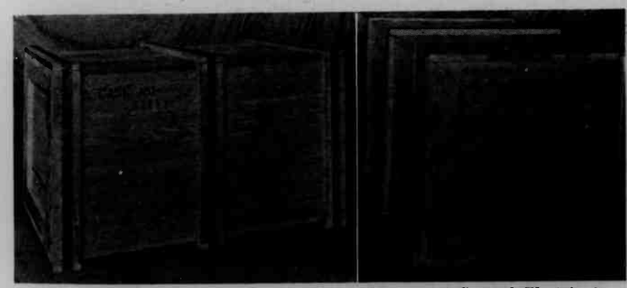
[1] The essential features of the bulletins here in question are reprinted in Chapter V.



Courtesy of General Electric Co.

(19) CASE CONTAINING TOP HALF ARMATURE.

Note notches cut for slings, ventilating holes, band iron stretched tight nailed from 4 to 6 inches. Shipping marks appear on two sides of case which weighs gross 37,410 lbs., net 31,200 lbs. Height 113", width 73", length 217".



Courtesy of General Electric Co.

(20 and 21) CASE OF UNUSUALLY RUGGED CONSTRUCTION.

(Left) Side view of case. Thickness and class of lumber varies according to weight and nature of contents. Capable of withstanding all sorts of hardships even in transit. (Right) End view of the same case.

INTENTIONAL SECOND EXPOSURE

container or inadequate markings may result in the following:

1—Refusal by the steamship company to accept the shipment,
2—The destruction or loss of material in the cargo aboard ship,
3—The destruction or loss of material between ship and shore,
4—Accident or loss while lying on the piers,
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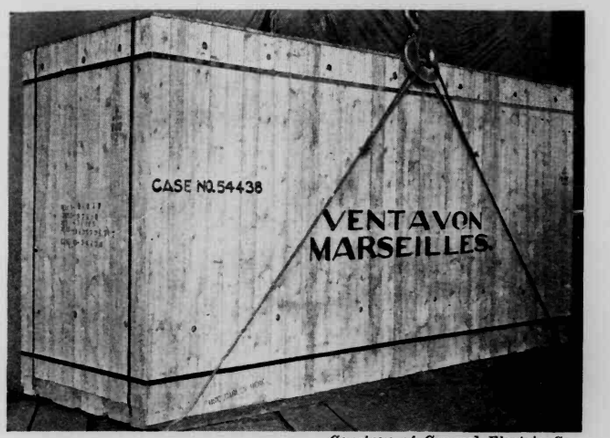
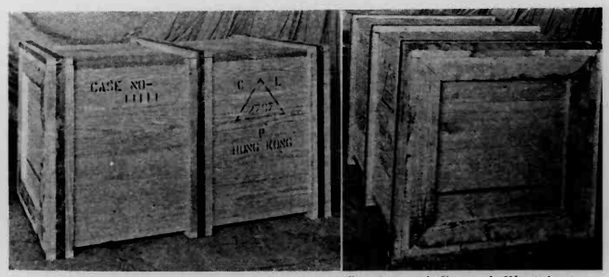


Courtesy of General Electric Co.

(19) CASE CONTAINING TOP HALF ARMATURE.

Note notches cut for slings, ventilating holes, band iron stretched tight nailed from ½ to 6 inches. Shipping marks appear on two sides of case which weighs gross 37,410 lbs., net 31,200 lbs. Height 113", width 73", length 217".



Courtesy of General Electric Co.

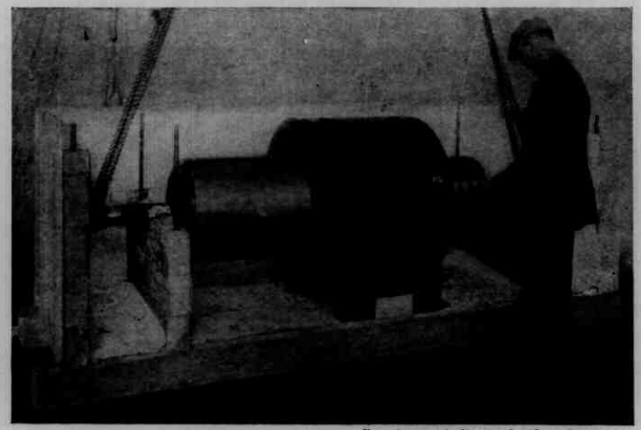
(20 and 21) CASE OF UNUSUALLY RUGGED CONSTRUCTION.

(Left) Side view of case. Thickness and class of lumber varies according to weight and nature of contents. Capable of withstanding all sorts of hardships even in transit. (Right) End view of the same case.

Courtesy of General Electric Co.

(22) PACKING OF ARMATURE FOR CONVERTER.

Interior of case and preparations for landing armature in case. Note waterproof lining of case, application of protective rust preventive compound, and bed of excelsior covered with oilcloth case lining prepared for body of field.



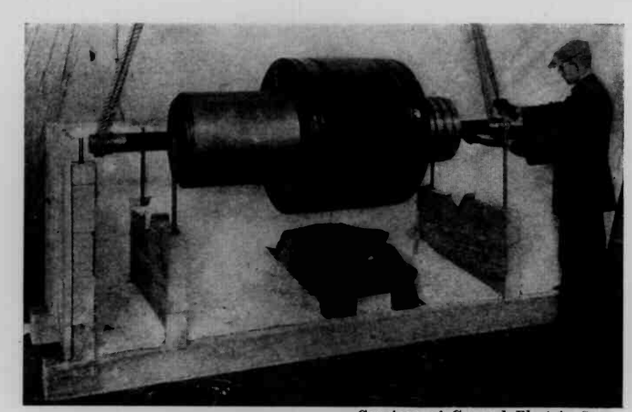
Courtesy of General Electric Co.

(23) MAKING A TENSION LINE TEST.

Armature has been placed in case, and distribution of weight is being tested by tension on string in order to equally divide weight between face of armature and shaft bearings.

to prevent their being crushed by superimposed weights and prevent collapse in the event of cases being turned on their sides. For example, in photograph No. 1, page 11, the frame of this apparatus is engaged by cross braces which are also supported by endwise braces from the cross brace to the end of the case. These braces are held in place by nailing through the top of the box. The long side brace is in position where it will not increase the size of the container, but will provide protection in dissipating any strain over the whole side of the case should it be turned on its side. Attention is drawn to the corner posts shown in photograph No. 4, page 12. These are found necessary in cases of certain dimensions as a support to prevent the case from collapsing or otherwise being unfavorably affected by any cargo which might be stowed on top of it. Photograph No. 6, page 21, illustrates the bracing in and around the yoke of a converter, which is here shown providing protection for it regardless of the manner in which it may be handled; in other words, if it is thrown on its side or end there is no serious damage likely to result. The welding machine shown in photograph No. 9, page 31, is shown shipped complete with top mechanisms, because these mechanisms require adjustment and if removed the customer might have considerable trouble. The result is, there is a considerable empty space in the box and in order to protect the contents properly, cribbing supports have to be built which also ensure against the top collapsing from cargo load. The framing shown in photograph No. 12, page 32, is required in order that the case may be as rigid at the top as at the bottom so that should it ride on side, end or top, it would still retain its rectangular form. The use of corner posts already referred to will further be observed in photograph No. 18, page 52. These heavy corner posts are capable of supporting any load in cargo stowage, and the box itself is made of two thicknesses of lumber nailed together, one at right angles to the other, the nails being clinched. The inner course is made shorter than the outer course at each of

INTENTIONAL SECOND EXPOSURE



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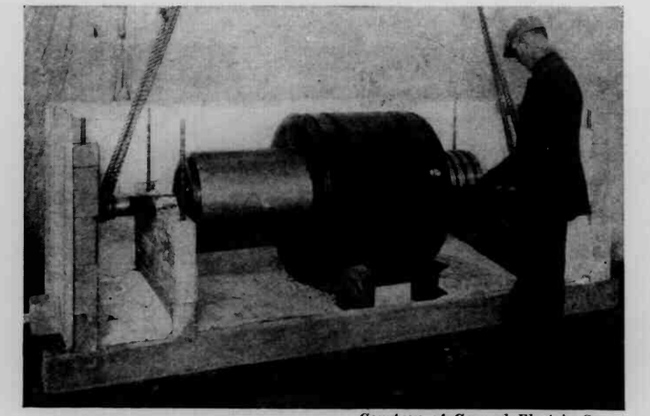

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the joints a distance to correspond with the thickness of the lumber used, so that the sides and ends come together at each joint with a step joint. The cover meets the sides and the ends in the same manner. This method of joining sides, ends and top together provides a strong joint and easy means of adequate and substantial nailing. It should be observed that this piece of apparatus weighs over 15 tons. Good illustrations of containers of the most rugged construction capable of withstanding all sorts of hardships in transit, are shown in photographs No. 20, page 87, and No. 21, page 87, showing end view and side view, the thickness and class of lumber being varied to correspond with the weight and nature of the contents.

The use of a crate in packing certain forms of machinery is illustrated in photographs No. 7, page 22, and No. 6, page 21. The crate provides a visual survey of the contents. It is believed to provide a reasonable amount of protection for semi-fragile material where the contents are of such a character that the risk of pilfering does not have to be considered. Another use of the crate may be noted in photograph No. 30, page 100. In this example the sides of the crate are of very light, springy construction, introducing shock absorbing qualities, and it is believed that when packing apparatus of the character of that shown the cases should be made as light as possible consistent with the safe carrying of the apparatus, so that the effect of blows will be the minimum.

Shape of Container.—Wherever possible the container should have the shape of a cube—all dimensions the same. The advantage of this construction is that it allows the case to ride in the position in which it lands, whereas if one dimension is much less than the others, the case will receive many more shocks from falling or tipping over while in transit.

It is sometimes desirable or necessary to depart from the preferred rectangular shape of container and build special cases of modified designs, very especially when it is necessary that the cases, if possible, ride on their bottoms. Photograph No. 16, page 42, for example,

shows a case in "A" shape. The accompanying photograph No. 15, page 42, shows the contents of this case, a switchboard, with the two ends and side of the case in position. This "A" shape is adopted in order to suggest its riding in an upright position, although if it were to be turned over it is doubtful if any injury would be done the switchboard, which is to be delivered to the customer without being knocked down. So far as possible, the "A" bracing is fastened to the case. The "A" frame support and the cross tie were found necessary in order to prevent the switchboard from turning over. The same result is sought in the use of the fan extensions at the bottom of the crate shown in photograph No. 30, page 100, which indicate the position in which the crate is to ride. Observe also the handle at the top which is to indicate the manner in which the crate is to be handled. Photograph No. 28, page 99, shows an odd shape of packing, the same being the complete boxing of the apparatus shown in photograph No. 27, page 94. Attention is here drawn to the boxing, or housing, over the extended shaft.

Protection from Moisture.—The case should be lined with waterproof or moisture-proof covering, particularly if the contents are such as could be damaged by water or dampness. Even when material is proof against damage by moisture, it is nevertheless desirable to line the cases, for it provides the protection which allows the materials to arrive in a clean condition and new in appearance—a feature highly desirable in the marketing of any product. This case lining should be of a quality and a strength consistent with the nature of the contents and the weight and size of the case.

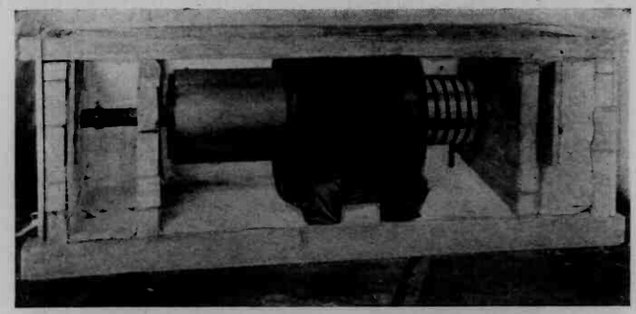
In large cases the lining material should be strong on account of the excessive shrinkage; also a large case is more easily racked (thrown out of rectangular shape) and this tendency imposes severe strains on the case lining. The case lining should be fastened to the inside of the box only sufficiently to hold lining in place, i. e., should be free from it—a method which prevents the

lining from being subjected to strains produced by shocks, racking or shrinkage.

Additional Protection.—In addition to waterproof case linings mentioned above, the apparatus or contents should be securely covered with waterproof cloth or a good grade of waterproof paper securely fastened to the contents.

The practice of making a double case and placing the waterproofing between the two thicknesses of lumber is ineffective and a waste of both time and material, for as the lumber shrinks, the waterproofing becomes torn at the joint—the very place where it is really wanted. But when the cases are lined on the inside, allowing a fullness of material and fastened only sufficiently to insure its remaining in place, this constitutes an effective covering which is not likely to be destroyed by the shrinking of the lumber or the racking of the case.

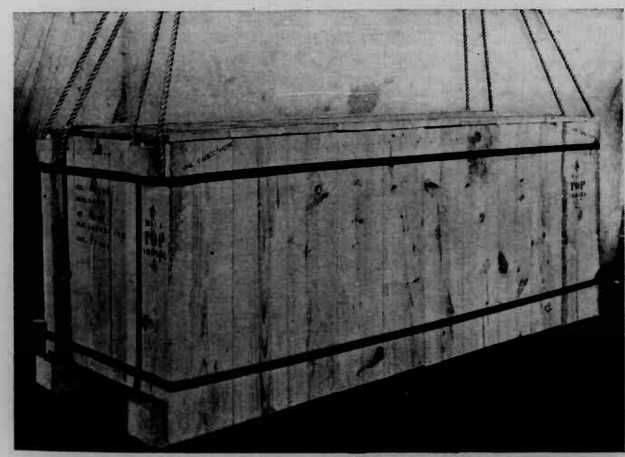
As illustrating practical methods of using case linings and otherwise rendering machinery proof against damage from humidity as well as water, attention is drawn to the reproductions of numerous photographs showing the packing methods employed by this company. For example, photograph No. 1, page 11, illustrates how case and skid are lined with cotton covered waterproof treated paper on the inside so that it will not be affected by the shrinkage of the lumber. In photograph No. 3, page 12, it will be noted that the skid has been lined with cotton covered waterproof paper. The case shown in photograph No. 18, page 52, is lined on the inside and before final closing the apparatus is thoroughly covered with carriage cloth securely fastened. Photograph No. 17, page 51, is another illustration of the same stationary armature and in this photograph it will be noticed that the skid has been covered with cotton covered waterproof paper. The oil cloth case lining covering a bed of excelsior will be observed in photograph No. 22, page 88. This same case is lined with cotton covered waterproof paper on the inside so that it will not be affected by any shrinkage of the wood. It is regarded as a mis-



Courtesy of General Electric Co.

(24) PARTLY COMPLETED CASE FOR ARMATURE.

Armature is clamped in place, wedged at each end, and shaft is thoroughly slushed.



Courtesy of General Electric Co.

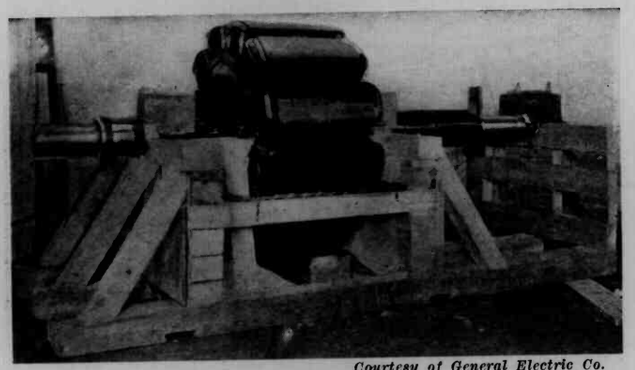
(25) ANOTHER METHOD FOR PROVIDING FOR USE OF SLINGS.

Armature completely boxed and ready for shipment. Note horns provided for engaging slings. Later practice cuts off these horns and provides slots on under side of skid for slinging.

Courtesy of General Electric Co.

(26) METHOD OF SKIDDING YOKE OF CONVERTER.

Note application of rust preventive compound to machined surfaces of yoke and to skid where such surfaces rest.



Courtesy of General Electric Co.

(27) PACKING OF ROTATING ELEMENT WITH SHAFT.

Note bearing under shaft close to field, and further at end of extended shaft, this latter carrying no weight. Cradle padded with excelsior and covered with oilcloth case lining. Observe blocking held in place by angular braces making contents a solid mass. For detailed description of method employed see text.

take to place waterproof paper between the two thicknesses of lumber because when that lumber shrinks it will carry the paper with it, destroying its value as waterproofing. Again in photograph No. 27, page 94, there appears an example of an excelsior padding covered with oil cloth case lining.

Preventing Rust and Mildew.—Cases containing machines or a large body of metal should be properly ventilated. The old way of tightly enclosing them in order to exclude moisture has been proven to be a mistake. Ventilating can be done by boring two rows of two inch holes. One row of holes should be at convenient points near the top and another row near the bottom on sides or ends of containers. There should also be a few holes in the bottom to permit the escape of water which may wash in through the ventilating holes. The holes should be covered by a piece of wire screen, of approximately one-half inch mesh, nailed to the inside of the case in order to prevent the entrance of mice or rats; and the ventilating holes should be from 18 to 24 inch centers, depending on the mass of metal.

In addition to the wire screen another provision may be made on the inside of the case behind the holes. When water swashes inside these holes or a driving rain penetrates, means must be taken for preventing this water from reaching the contents. A tin, sheet iron or zinc deflector is nailed over the inside of each hole securely fastened to the case. This deflector, or metal baffler, is about 8″ long and is larger at the top than at the bottom; roughly it resembles one-half of a cone split longitudinally with flanges for nailing. The deflector should be centered with respect to the holes. This not only prevents the water from striking the contents but also directs the water downward along the sides of the case where it can run out of the bottom holes.

Many examples are to be noted among the reproductions of photographs accompanying this chapter of the fashion in which it has been found desirable to ventilate cases containing machines or large masses of metal in

INTENTIONAL SECOND EXPOSURE

Courtesy of General Electric Co.

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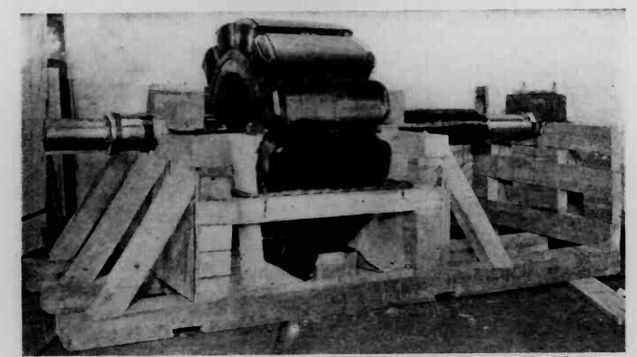

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In addition to the wire screen another provision may be made on the inside of the case behind the holes. When water swashes inside these holes or a driving rain penetrates, means must be taken for preventing this water from reaching the contents. A tin, sheet iron or zinc deflector is nailed over the inside of each hole securely fastened to the case. This deflector, or metal baffler, is about 8″ long and is larger at the top than at the bottom; roughly it resembles one-half of a cone split longitudinally with flanges for nailing. The deflector should be centered with respect to the holes. This not only prevents the water from striking the contents but also directs the water downward along the sides of the case where it can run out of the bottom holes.

Many examples are to be noted among the reproductions of photographs accompanying this chapter of the fashion in which it has been found desirable to ventilate cases containing machines or large masses of metal in

order to prevent rust and mildew. Ventilating holes covered by wire screens will be observed in photograph No. 1, page 11, and in the photograph of the same machine fully boxed, photograph No. 2, page 11. This shows the ventilating holes from the outside. Other similar photographs of completed cases give illustrations of ventilating holes provided to prevent the accumulation of moisture by condensation and to relieve the air pressure on the inside of the case.

Metal Containers.—The practice of shipping miscellaneous material in metal containers or metal lined containers has been abandoned by us except when specially requested by our customers. Metal containers and metal linings do not prevent rust. Not only is this metal likely to be punctured by nails, or have the seams opened up by rough handling, twisting or racking the case in transit, but it has been found that pin holes are likely to occur in the soldering even when the container has been carefully handled or even not handled at all.

Self-Sealing Pitch Covered Canvas.—Instead of the metal containers, we now use self-sealing pitch covered canvas, which will not crack from cold and which is rendered even more flexible by heat. Its flexibility prevents puncturing, and being also very tough, the covering will not rip even if the case racks. This has been found the best for waterproof covering for shipments to be carried on the backs of burros or for muleback transportation, or where material is transported in an open boat, or is required to stand in the open without cover.

Protecting Nickeled and Bright Parts.—Bright brass, copper or nickeled parts can be properly protected by wrapping securely with soft paper free from sulphur. Bright steel parts should be thoroughly cleaned and dried and coated with rust preventive compound—not vaseline or white lead and tallow, or any of the so-called "home preparations." There are many good preparations made especially for this purpose which are now on the market.

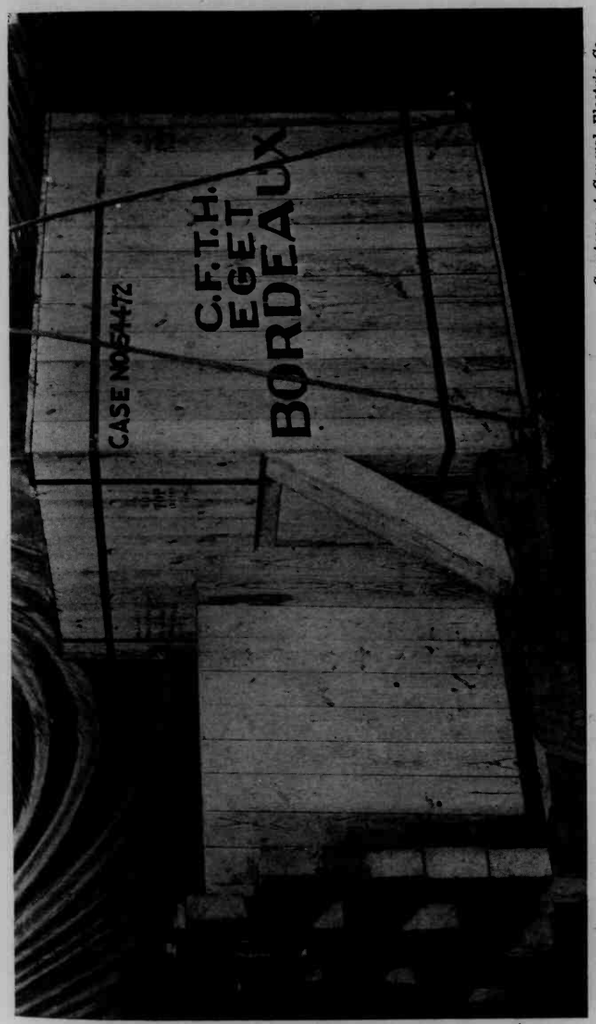
A number of evidences of the way in which bright

parts of machinery have been protected before and during packing will be observed among the accompanying photographs. In photograph No. 3, page 12, it will be noted that the bearing parts of the skids which are to come in contact with the finished parts of the machine have been covered with rust preventive. The same piece of apparatus is illustrated in photograph No. 6, page 21, in which there is to be observed the care which has been exercised in covering the parts that have been treated with rust preventive. In photograph No. 17, page 51, it will again be noted that the machined surface of joints where the upper and lower halves come together, is being thoroughly covered with rust preventive compound immediately before the apparatus is landed on the skid. The part of the skid on which it comes to rest will also be covered with the same compound. At the point where the shaft is to rest, shown in photograph No. 22, page 88, stains will be noted. These are from the slushing compound or rust preventive with which the wood at these points has been treated. Over this is placed a piece of zinc which is also covered with slush. In addition, the shaft is covered so that there is no possible lack of slushing compound at or near the point where the shaft rests. The same armature in another stage of packing is shown in photograph No. 24, page 93, where it will be noted that the shaft has been thoroughly slushed from one end to the other. Dark colored stains showing where machined surfaces have been covered with a compound for the prevention of rust are also to be noted in photograph No. 26, page 94. It will once more be noted here that the yoke bearing is in process of being covered with rust preventive, which will also be applied to that part of the skids where these bearings come to rest. In photograph No. 27, page 94, it will be noted that the shaft is carefully slushed under the bearings. The method followed is that in the first place the hollowed out wood section of the skid in which the shaft is to rest is covered thoroughly with a rust preventive. In this space is placed a piece of zinc of adequate length and width to

encircle the shaft and this is also treated with rust preventive, while the shaft itself before being placed in the bearing is also treated.

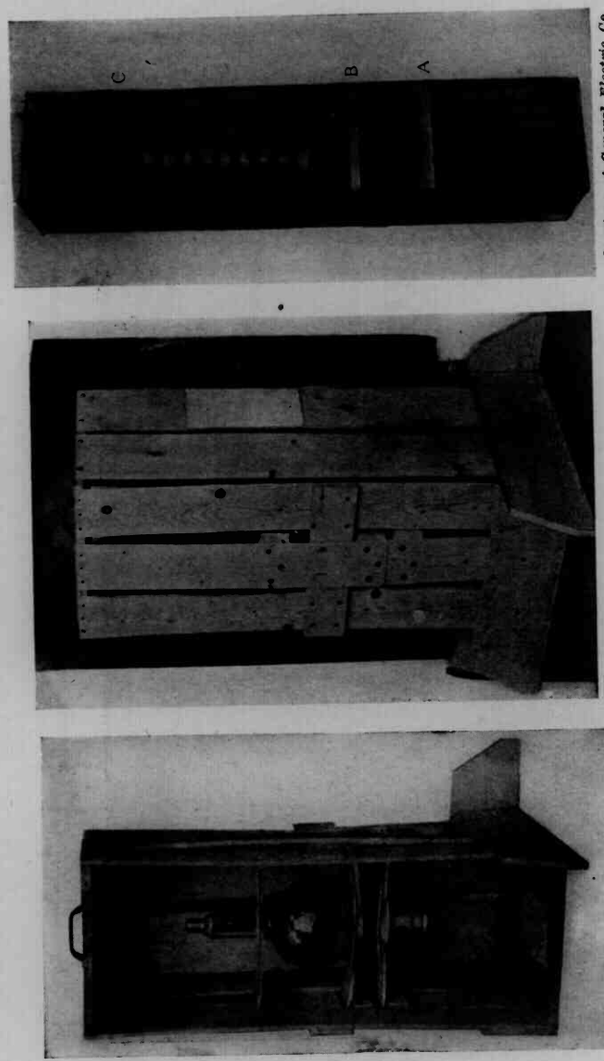
Shock Absorbers.—When cushioning or shock absorbing material is required between articles in the case, or between the contents and the case, there is a danger in the improper use of excelsior, hay, straw, paper, sawdust and similar material; for the person doing the packing may not provide the proper kind of cushion or the proper amount of cushioning material. However, a cushion of felt or cellular paper, or a wrapping of the enclosed articles therein, can be made to insure a definite or fixed cushion.

Among the photographs accompanying this article there will be noted several examples of the use of shock absorbing material and devices. For example, in photograph No. 11, page 32, observe the bed of excelsior which has been made to conform to the shape of the coils. The next photograph, No. 12, page 32, showing a crate of these coils illustrates the cushioning and the way in which a timber is placed between each row of coils. This timber has been padded at top and bottom with heavy felt. It is separated at the ends by a block so that all of the several courses of coils are held in place by the clamping arrangement, although each row or course is self-sustaining. Photographs No. 23, page 88, and No. 24, page 93, show how a bed has been prepared from timber shaped out to the arc of the armature body and of a width to engage the body of the armature. This is covered with excelsior and afterward with oilcloth. A similar bed or cradle is to be noted in photograph No. 27, page 94, which has been shaped out, covered with excelsior as a padding and then with a piece of oilcloth case lining. A different and unique as well as ingenious method of packing fragile goods for protection against shocks is illustrated in photograph No. 29, page 100. It will be noted that the X-ray tube here shown is suspended in cotton ticking ribbons which are drawn up so as to engage the sides of the crate, introducing additional spring or shock



(28) An Unusual Case. *Courtesy of General Electric Co.*

Contains rotating element of generator and shaft shown in No. 27. Note housing over extended shaft and use of band iron. Case complete weighs 33,200 lbs.



Courtesy of General Electric Co.

(29 and 30) PACKING OF X-RAY TUBE. (31) FIRST STEPS IN PACKING TRANSFORMER LEAD.

(Left) Shows tube suspended in cotton ticking ribbons drawn up to engage spring sides of case. (Center) Crate containing X-Ray tube. Note fan extensions at bottom to indicate position in which crate should ride, also handle at top. (Right) Note that in the packing of transformer lead, partitions A, B, and C are fastened against a metal shoulder.

absorbing qualities, these sides being made of about ¼-inch lumber. As evidence of the success of this packing, it may be said that about 4,000 of these X-ray tubes were shipped overseas during the last year of the World War with resulting breakage amounting to only about one-tenth of 1 per cent.

Partitions Inside Cases.—Cross partitioning is a feature which provides protection to the contents of cases. These partitions can be either lateral or longitudinal and should be fixed in position by nailing, either through the sides or the ends of the case. This method prevents the contents of the case from surging, for when the case gets a severe jar on one end, cross partitions prevent the blow imparted by the whole weight of the contents being delivered to the articles at the bottom. Partitions also add strength and rigidity to the case.

A good example of the commonest way in which partitions may be used in export packing cases is to be noted in photograph No. 31, page 100, which shows the packing of a transformer lead made of porcelain and metal, the metal section being a sleeve shown between partitions A and B. The balance of the lead is made up of sections of porcelain fastened together by cement. The section from partition C to the end of the case is a glass globe or oil indicator, the center of this lead being filled with oil. This lead weighs about 700 pounds net. It could not be handled in a horizontal position without protection, for otherwise it would break of its own weight. Partitions A, B and C are fastened against a metal shoulder which prevents the lead from moving. Other forms of packing to guard against the shifting of machines inside of cases are to be noted in many of the accompanying photographs. Note, for example, in No. 1, page 11, that in addition to bolting the machine to the skid, it is blocked both longitudinally and laterally so as to relieve from a shearing strain the bolts holding the machine to the skid. Similar protection is notable in photograph No. 8, page 22, in which attention may be drawn to the fact that the shaft is blocked at the end, the block

being fastened through the outside of the box. In photograph No. 18, page 52, attention is called to the five sets of braces equally spaced around the piece, engaging the piece at the center where it is strongest and extending to each side of the case. This will be securely nailed through the side of the case in order to provide a support for the piece, and prevent the throwing of severe leverage on the bolts which fasten the load to the skid, in the event that the case happens to be turned on its side during transportation. Photograph No. 24, page 93, shows an armature clamped in place and wedged at each end. Very valuable hints are to be found in photograph No. 27, page 94. It should be noted that in addition to the cradle which supports the body of the field, bearings are also provided under the shaft on each side close to the field and a further bearing is provided at the end of the extended shaft, which is simply a balancing bearing and carries no weight. The blocking on each side of the field, providing the bearings, is held in position by angular braces on the outside and, being wedged on the inside between the field body and this blocking, makes the entire container and its contents a solid mass and prevents any movement of the field in the container. Attention is called to the character of these angular braces on the outside. They are let into the skid at the toe and at the other end support the wall of the cribbing and the timber, providing the bearing for the shaft, with crow foot construction. These are securely nailed at the ends but since this photograph was taken the experience of the manufacturer has shown that it is necessary further to fasten these braces and this has been accomplished by scabbing the toe to the skid. The scab consists of a one inch or one and a quarter inch board nailed over the joint which engages the brace and the skid.

Floating Fragile Material.—Delicate apparatus can often to advantage be packed in a lightly constructed case and this case "floated" in excelsior or other packing material inside of an outer case. This very effective cushion of excelsior between the inner and the outer case

should be made of a thickness to correspond with the nature and weight of the contents.

An illustration of how fragile materials may be carefully packed in a case which is then "floated" inside of an outside container, should be carefully studied. In photograph No. 32, page 105, the manner in which the contents of the inner case is protected from shifting has already been described under "partitions." This case is enclosed in an outer case as shown in the photograph with a cushion of excelsior about 5 inches thick on all sides, ends, top and bottom. Other ways in which fragile goods receive adequate packing are illustrated in photograph No. 29, page 100, which so far as the cotton ticking ribbon supports are concerned has been already described under the heading of "shock absorbers." It is further notable (see also photograph No. 30, page 100), that the crate is of very light construction so that any jar imparted by handling would be more like the blow of a tack hammer than the blow of a sledge hammer, as it might be in case the crate were made of heavier lumber and the weight increased. A point to be carefully observed in the packing of apparatus of this character is to make the case as light as possible consistent with the safe carrying of the apparatus.

No Loose Small Parts.—Wrenches, accessories, other tools or small parts are often enclosed in the case with a machine. These, however, should always be securely fastened, because they are likely to do severe damage due to their movement inside the case during transportation and handling.

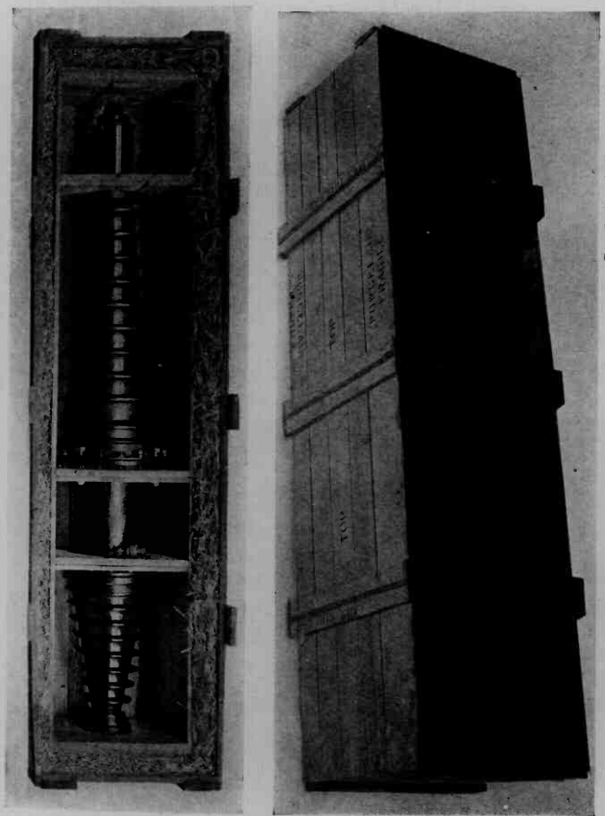
The best method is to place these small parts in a box and then to have the box, not only nailed, but also fastened by band iron to the skid or the inside of the box. Heavy boxes should be both spiked and strapped to the skid. The lighter boxes should be nailed and strapped to the sides, end or top.

The accompanying photographs, No. 34, page 106, and No. 36, page 111, illustrate in a general way the fashion in which parts may be packed in cases contain-

ing the main apparatus. This shipment consists of a 36 inch searchlight mounted on a Ford chassis. It was necessary to forward the outfit as nearly as possible in completely assembled condition, while at the same time the cost of space on cargo ships was so high that it was very important to minimize the cubical dimensions of the shipment. The wheels were therefore removed from the chassis and the projector was mounted on a skid. The wheels were fastened on the inside of the case as shown and the accessories were packed in separate boxes, etc., and arranged on the interior of the general packing case in the fashion illustrated. The one case therefore contained the complete outfit. Attention is also drawn to photograph No. 15, page 42, in which the box containing sundries will be noticed firmly attached inside the general packing case.

Battens.—Battens on cases are highly desirable, particularly if the case contains a heavy load. No end battens should be less than three-quarters of an inch in thickness and two inches in width. For heavy loads and where rough handling is to be expected, it has been found well to provide four mitred end battens.

Banding Iron.—In order to protect the nailing of the case, no case should ever be forwarded for export unless it is provided with end battens and banded with rust-proof band iron. The band iron, if of proper quality and properly put on, will arrest many shocks which otherwise would be imparted to the nailing of the box. Therefore, the band iron should not be put on directly over the nails if the best results are to be obtained; but back from the nailing in the direction of the center of the box, up to a distance of six inches from the nailing on large cases. The exact distance should be determined by the conditions that will admit of proper nailing of the band iron. These nails should be from four to six inches apart, but care should be taken not to drive the nails through the case at points where they may damage the contents. All of our banding iron is enameled so as to make it proof against rust, and we make it a practice of banding all of



Courtesy of General Electric Co.

(32 and 33) METHOD OF PACKING TRANSFORMER LEAD.

Transformer lead enclosed or "floated" in an outer case with a cushion of excelsior about 5" thick on all sides, ends top and bottom. Note that marking in English on the case is practically useless.

INTENTIONAL SECOND EXPOSURE

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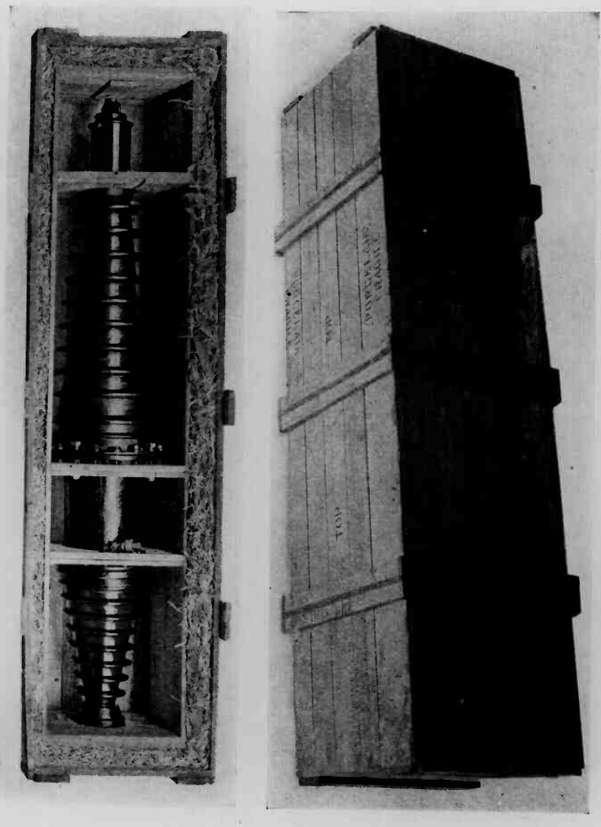

Courtesy of General Electric Co.

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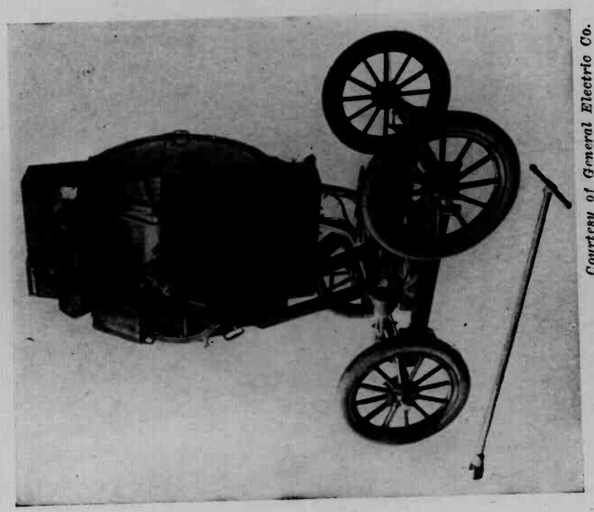
Transformer lead enclosed or "floated" in an outer case with a cushion of excelsior about 5" thick on all sides, ends top and bottom. Note that marking in English on the case is practically useless.

Courtesy of General Electric Co.

(35) SEARCHLIGHT MOUNTED ON SKID.
Note that wheels have been removed in order to pack in the least possible cubic dimensions.



Courtesy of General Electric Co.

(34) A SEARCHLIGHT MOUNTED ON CHASSIS.
Shipped during the war as nearly as possible in completely assembled condition.

our export cases, both large and small, heavy and light. More on the subject of "Banding Iron" will be found under the heading of "Skidding." What is true of fairly light cases is also true of skidded cases—they both need band iron. These bands are drawn tightly—as tight as a fiddle string—and they are well nailed.

But to improperly band a case is worse than not banding it at all. The band iron soon arranges itself in festoons or loops, if not properly tightened and fastened. These loops catch on and damage other cases. They also make a convenient loop for the stevedores' hooks and hence the damage is cumulative. In many other ways, loose band iron promotes rough usage and creates additional hazards.

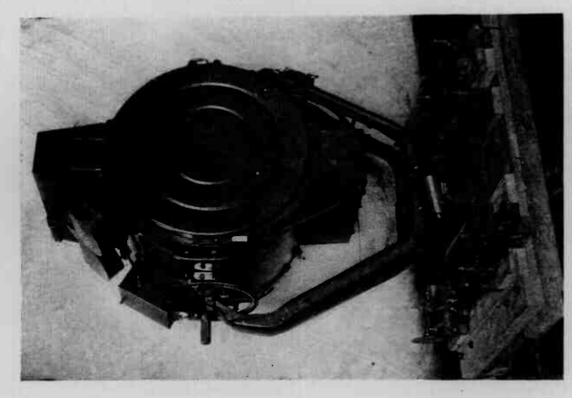
Unannealed band iron is superior to the annealed. The former can be easily nailed through, it is much stronger and it will not stretch as will the annealed. The band iron on a case performs its real function when the case is subjected to a severe strain by shock or great pressure; so it will be seen that as the band iron stretches upon those occasions, it will not protect the nailing of the case as it should.

Abandoned Wire for Cases.—In past years we used braided, twisted, single and double strand round wire for banding large cases. However, we have ceased to use this method as it was found to fall short of the requirements for strengthening cases. For some small cases containing light loads we still use some "wire bound" boxes which are satisfactory when strengthened by additional nailing.

Markings.—A feature of the greatest importance in marking cases is the quality of the marking fluid. This fluid should be indelible and of a character that can not be easily removed or blurred by rubbing. The containers must often stand next to a bale of cotton cloth, which due to vibration may erase the markings in transit.

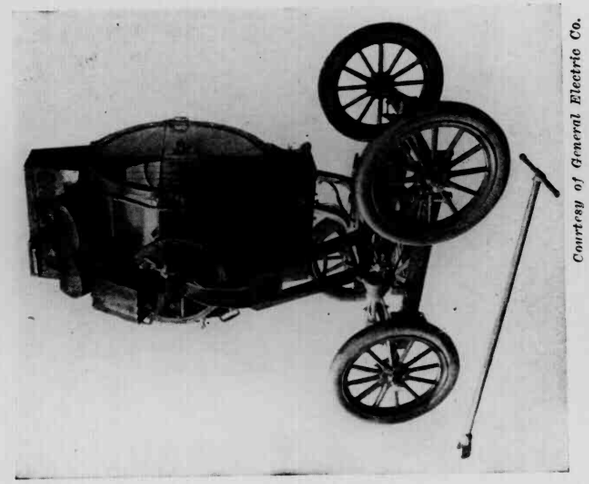
In addition to being indelible and difficult to remove, the fluid should be quick drying so that the cases or bales can be handled soon after without risk to the marking.

INTENTIONAL SECOND EXPOSURE



Courtesy of General Electric Co.

(35) SEARCHLIGHT MOUNTED ON SKID.
Note that wheels have been removed in order to pack in the least possible cubic dimensions.



Courtesy of General Electric Co.

(34) A SEARCHLIGHT MOUNTED ON CHASSIS.
Shipped during the war as nearly as possible in completely assembled condition.

our export cases, both large and small, heavy and light. More on the subject of "Banding Iron" will be found under the heading of "Skidding." What is true of fairly light cases is also true of skidded cases—they both need band iron. These bands are drawn tightly—as tight as a fiddle string—and they are well nailed.

But to improperly band a case is worse than not banding it at all. The band iron soon arranges itself in festoons or loops, if not properly tightened and fastened. These loops catch on and damage other cases. They also make a convenient loop for the stevedores' hooks and hence the damage is cumulative. In many other ways, loose band iron promotes rough usage and creates additional hazards.

Unannealed band iron is superior to the annealed. The former can be easily nailed through, it is much stronger and it will not stretch as will the annealed. The band iron on a case performs its real function when the case is subjected to a severe strain by shock or great pressure; so it will be seen that as the band iron stretches upon those occasions, it will not protect the nailing of the case as it should.

Abandoned Wire for Cases.—In past years we used braided, twisted, single and double strand round wire for banding large cases. However, we have ceased to use this method as it was found to fall short of the requirements for strengthening cases. For some small cases containing light loads we still use some "wire bound" boxes which are satisfactory when strengthened by additional nailing.

Markings.—A feature of the greatest importance in marking cases is the quality of the marking fluid. This fluid should be indelible and of a character that can not be easily removed or blurred by rubbing. The containers must often stand next to a bale of cotton cloth, which due to vibration may erase the markings in transit.

In addition to being indelible and difficult to remove, the fluid should be quick drying so that the cases or bales can be handled soon after without risk to the marking.

All shipments should be marked with stencil, the size of letters corresponding to the size of the container. Where possible the container should be marked with a case number and the shipping address on two sides. On the sides of the case bearing the address, there should be no other markings except the number of the case. However, in very large cases which must be handled with lifting devices, it is permissible to show slinging positions and the center of gravity by center lines. Elsewhere on the case—preferably on the ends—may be shown the gross weight, the net weight, the measurements of the case, and other marks such as may be required. The case number should always be preceded by the words "Case number." The case number and the port marking should always be made to stand out boldly in larger figures and letters.

Numerous photographs are reproduced in connection with this chapter, showing desirable ways of marking cases. Photograph No. 19, page 87, illustrates marking on cases to call attention to the points where the sling cables should be applied. The shipping marks on this case appear on two sides and no other marks excepting the case number and the handling marks appear on the sides. Marking on the case shown in photograph No. 38, page 111, also indicates points where the slings are to be placed. Also note marking at top of case in French, English and Spanish with arrow indicating the top. It will be noted in photograph No. 33, page 105, that this case has been marked in several places "porcelain" and "fragile." This evidently was done by the packing men from force of habit in marking domestic shipments. For export such markings as "porcelain," "fragile," "handle with care" are practically of no use in providing any help in the way of notice to stevedores as to the nature of contents. In loading and discharging ships no time is taken to read such notices and at many ports to which shipments are forwarded such marking would not be understood.

Branding.—With a real indelible fluid it is unnecessary to brand the cases with a branding iron; however, metal dies are used to accomplish practically the same result as branding and at the same time eliminate the fire risk. These dies may be procured in different sizes to correspond with the sizes of the cases to be marked. They have a sharp edge which is coated with marking ink by saturating a piece of felt with the ink and working the die into it by hand. After being coated with ink the die is driven into the wood of the box by a hammer. This has been found equal to branding, and quicker, cheaper and safer.

Marks on the cases such as "Fragile," "Glass," "Handle with care," "This side up," etc., etc., are of practically no avail in procuring special service or special care in handling the material. The materials must be so packed that the container riding in any position will withstand the maximum hazards of export transportation.

Skidding.—The strength of the skid lies entirely within the skid itself and receives very little additional strength from the container. In figuring the strength of the skid the packer should entirely ignore the container. A container built up on a weak skid is like a building on a faulty foundation. A chain is only as strong as its weakest link and a container is only as strong as the skids which form its backbone. While the container adds practically no strength to the skids, yet if the skids are broken it racks and wrecks the entire container as well as the apparatus being shipped. Or if the skids should spring or bend, the entire case will probably be destroyed. The skid is the strategic point of the container. It is a curious thing how the same human being who hesitates to put a few more inches of lumber in the skids where it is absolutely essential, is likely to lavish lumber on the balance of the container. Lumber put in the skids is a factor of safety—it is container insurance.

How Skids Break.—Whenever a container is lifted from one end or from one corner, the skid is likely to break or spring and ruin the container. Whenever the container is rested on one roller, in the middle or on two

rollers, one at either end, the skid is likely to break or spring. Instances have even been known where skids have broken or sprung because the container was merely laid down upon an uneven surface.

Containers are frequently broken, due to damaged skids resulting from the apparatus being improperly bolted to the skid. We make it a rule to have no square bolt heads projecting beyond the lower surface of the skids. The bolt holes should be countersunk and the bolt put in from the bottom so that the square head will not project and interfere with the passage of the skid over the rollers. Round headed bolts are also desirable for this reason. In either case the bolt should project through the apparatus and have the nut at the top. Sometimes wood clamps are used for fastening containers to skids, but they should be of hard wood and strong.

Containers should be so built that they will not be racked if the stevedores make their donkey sling-hitch at a point above the skids. Therefore, the sides, ends and top should be strong, and unless they are reënforced by cribbing or bracing of contents, the high hitching will likely damage them.

But the skidding is important for still other reasons. Not only must the entire container be of sufficient strength to withstand the various shocks of transportation, but it must be able to stand up under the strain of cargo storage while in the hold of the ship.

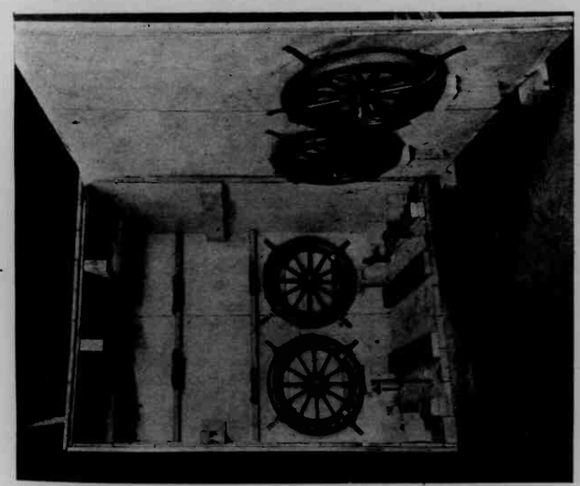
In the accompanying photograph No. 17, page 51, it will be noted that there are three bearings for the piece, one at each end and one in the center, this center bearing also preventing the bending or breaking of the skids in the event of its being moved by rollers or resting on an uneven surface.

Fine Points in Case Construction.—Where the contents of a skidded container is of such a character that it may be injured by racking due to pressure at the top, there should be provided supporting posts from skid to underside of cover, securely nailed through casing.

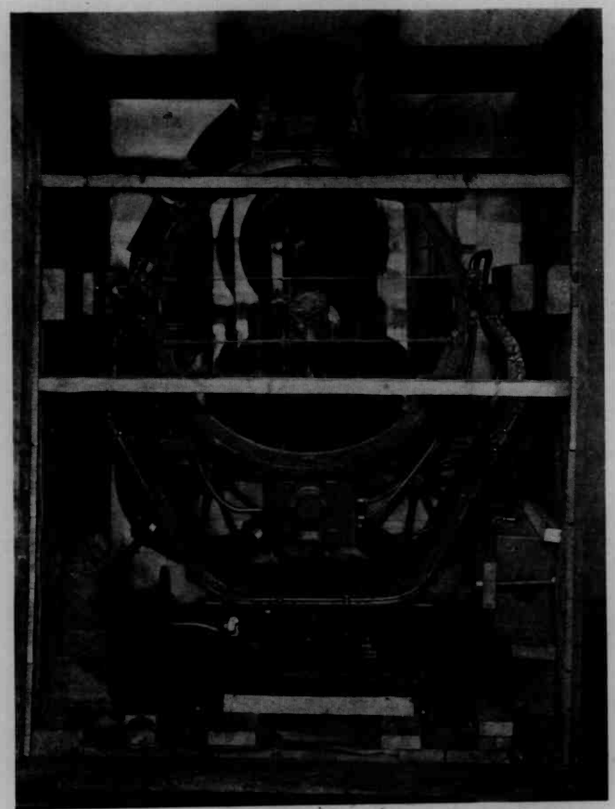
The ends of the case should rest on the skids and be

Courtesy of General Electric Co.

(38) PROJECTOR BOXED AND READY FOR SHIPMENT. *Note place for slings notched out of skids, marking, perforation to relieve air pressure, etc.*



(36) METHOD OF PACKING SEARCHLIGHT. *Inside of case showing manner in which wheels are fastened to sides.*



Courtesy of General Electric Co.

(37) COMPLETE PROJECTOR IN CASE.

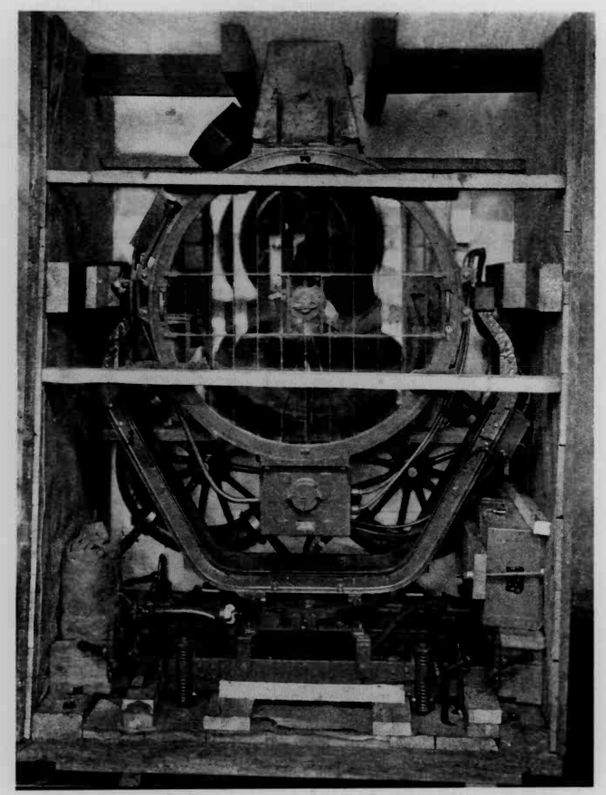
Note how searchlight and accessories are made a compact mass.

nailed to the binder or cross tie. The sides of the case, however, require different treatment for the best results. Although the inside or horizontal course should rest on the skid, the outer or vertical course should be longer, thus it can be made to overlap the skid and extend down almost but not quite, to the bottom of the skid. But there is another reason which is not so apparent, and that is it enables the container better to resist compression of a heavy cargo placed on top. These side boards are brought down within about a quarter of an inch of the bottom of the skid so that when the strain of the weight of storage is imposed, the strength of the box need not depend entirely on the strength of the holding power of the nails; for, as the nails give or bend a little, this form of construction allows these vertical side boards to take up the load. The heavy weight on top of the case and the resulting slight giving of the nails permit the sides of the case to come to rest on practically the same level as the bottom of the skid; thus the container is saved from collapse. A distance of one quarter to three eighths of an inch has been found sufficient as a clearance between the bottom of the skid and the bottom of the vertical boards, which compose the outer course of the sides of the case. But these side boards should not be so long as to interfere with rollers, and should be kept above the bottom of the skid for the same reason that the square heads of the bolts are not allowed to project downward.

Don't Use Lag Screws.—In the construction of skids, do not use lag screws and in fastening apparatus or other articles to skids, do not use lag screws. Also in fastening the bracings in all shipping and packing work, do not use lag screws but use bolts. Even nailing is preferable to lag screws, as it is most difficult to draw a lag screw "home" without overdoing it. A single turn or even a part of a turn on a lag screw after being properly set, practically destroys its holding power.

Slinging.—Wherever possible, large cases or pieces which must be handled with lifting devices, should have

INTENTIONAL SECOND EXPOSURE



Courtesy of General Electric Co.

(37) COMPLETE PROJECTOR IN CASE.

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Slinging.—Wherever possible, large cases or pieces which must be handled with lifting devices, should have

provision made for slinging. When the horizontal center of gravity of container is off the center of measurements, we provide slots in the skids and mark the cases at those points "Sling here." In addition we provide a center line on each side of the case indicating the center of gravity and so stencil it on the case.

In photograph No. 1, page 11, it will be noticed that the skids are slotted at each end. This is for the slinging. The same feature will be observed in numerous others of the accompanying illustrations. Another way of providing for the use of slings is illustrated in photograph No. 25, page 93. However, since this photograph was taken an improvement has been made over this method. The horns or extensions which are shown in the photograph as engaging the slings are cut off and the underside of the skid is slotted for slinging. This reduces the cost of shipping to the extent of the measurement of the horns previously used since, of course, steamship companies figure cubic measurements over all extreme dimensions. In photograph No. 27, page 94, especially careful attention should be directed to the location of the slots in the skids which are cut out for slinging the apparatus, the center of gravity being midway between the two slots.

The strings which are shown in one of the photographs, No. 23, page 88, are placed under the bearings in the process of packing rotating elements for electrical apparatus and are for testing application of weight applied to the several bearings in order that we may determine whether the strain as imparted by the load going into the container is being equally distributed to the three bearing points.

The cribbing made to take the shaft bearings is a solid wood mass built so as to engage this shaft. Now before placing the load into the carrier or container, these strings are placed under each of the three bearings and as the load is lowered into the container, by the tension applied to these strings we are able to detect the equalization of pressure between the three points of bearings.

CHAPTER V

OFFICIAL SPECIFICATIONS—EXPERT INSTRUCTIONS

TREMENDOUS progress in the science of export packing was made during the course of the World War, and the lessons to be derived from the exact and specific instructions issued by the War Department of the United States Government are certain to ensure a marked improvement in the packing practices of manufacturers and shippers in general. Probably in no other country has the export packing problem been attacked so scientifically and in so thoroughgoing a fashion as in the United States, where national needs from the outset of the war brought officials face to face with problems of overseas shipping which were not encountered by other nations. The results of official study, painstaking investigations and comparison, the researches of the Forest Products Laboratory, plus the ingenious inventions of men called into the service of the army in devising the best possible packing methods—these all resulted in the publication of official specifications by the War Department and in a great deal of consequent and subsequent literature, based on these experiences and researches, which it is believed ought to be preserved in permanent fashion. Important excerpts are here included, with the conviction that the matter reprinted in this chapter will be found vital by every manufacturer or shipper disposed to give serious attention to this most important problem.

Certain duplications have been omitted from the official specifications reprinted in this chapter because identical advices or instructions appear in other chapters. It is none the less quite natural that there should be some repetitions of observations and instructions both among

the documents themselves, which are now reprinted, and in the several other chapters of this book. It has been thought desirable to include many such repetitions, not only because sometimes involving slight variations in phraseology, but also because many of the problems dealt with merit repeated emphasis.

The documents which follow include extracts from the War Department specifications on making boxes and packing in boxes; a pamphlet on the same subject by Capt. Knowlton, issued by the Safepack Mills; the War Department specifications on the making of crates, on baling and on marking; an article from "The Barrel and Box" on the nailing of boxes; technical notes from the Forest Products Laboratory, etc.

Standard Boxing Specifications of the War Department

Nailed and locked corner boxes must be well manufactured from lumber which is sound (free from decay and dote) and well seasoned. Lumber must be free from knot holes and from loose or rotten knots greater than one inch in diameter. Knots whose diameter exceed one-third the width of the board will not be permitted, and no knots will be permitted which interfere with the proper nailing of the box.

For these specifications, well-seasoned lumber has an average moisture content of 12 to 18 per cent based on the weight of the wood after oven drying. To determine this moisture content weigh a piece of material before and after oven drying to a constant weight, dry at 100° C. (212° F.), and divide the difference in weights by the lesser × 100.

Width of Lumber.—(a) Any end, side, top, or bottom 6 inches or less in width should be one-piece stock.

(b) No piece less than 2½ inches face width shall be used in any part, except for cleats.

(c) The maximum number of pieces allowed in any end, side, top, or bottom more than 6 inches wide should

be as follows (narrow pieces should always be placed in the center of the ends, sides, top, or bottom):

Width of face	Maximum number of pieces
Six inches and under	1
Over 6–10 inches, inclusive	2
Over 10–15 inches, inclusive	3
Over 15–20 inches, inclusive	4
Over 20–25 inches, inclusive	5
Over 25 inches	6

Surfacing.—All material must be surfaced one or two sides. When surfaced one side the surfaced side shall be the outside.

Joining.—Ends 1 inch or less in thickness should be either cleated or butt joined and fastened with not less than three corrugated fasteners, two driven from one side and one from the opposite side. Cleats should be not less than 2 inches wide and should have a minimum thickness of five-eighths inch. Triangular cleats of not less than three-fourths inch face measurement are permitted.

Nails.—All nails should be standard cement coated box nails. Plain nails driven through and clinched may be used for cleating.

The size of the nail shall depend upon the species and the thickness of the lumber in which the points of the nails are held.

When the nail specified for use under these specifications is not obtainable, use the next penny lower, and increase the number of nails in each nailing edge by one.

[1] **Metal Bindings.**—All packing boxes for over-seas service must be strap ironed. Strapping shall be cold rolled unannealed steel not less than five-eighths inch wide by 0.015 thick, treated to prevent rust, and shall have a tensile strength of not less than 850 pounds. The treatment must be of a character to prevent injury to strapping when bent or nailed.

Strapping placed at least 1 inch from each end is preferred, with double corner nails and such additional nails or staples holding straps to sides, top, and bottom

[1] See Capt. Knowlton's observation and recommendations under this head, Chapter III.

as well minimizing festooning nails or staples spaced about 6 inches apart.

Strapping must be drawn tight by mechanical means in order to have the maximum of tension.

Standard Specifications for Wire-bound Boxes

Boxes must be well manufactured from lumber which is sound (free from decay and dote) and well seasoned. Lumber kiln dried at excessively high temperature or low humidities or below 6 per cent moisture, must be avoided. Material must be free from knot holes and from loose or rotten knots greater than 1 inch in diameter. No knots will be permitted which interfere with the proper nailing or stapling.

Cleats.—Cleat material must be free from knots and cross grain. Cleats must not be less than three-fourths inch wide, seven-eighths inch thick.

Wires.—Wires shall not be less than No. 14 gauge nor spaced more than 6 inches apart.

Staples.—Staples shall be spaced not more than 2 inches apart over each wire. Staples which are not driven into cleats must be clinched.

Ends.—On boxes not to exceed 20 x 15 x 10 inches inside measurement and carrying not to exceed 90 pounds the ends may be the same thickness as the sheet material, and should be nailed or stapled on the inside of the cleats. Nails and staples shall be spaced approximately 2 inches apart. On larger boxes of heavier weights the ends shall be nailed to battens or to solid ends set between the cleats. A seven-penny nail must be driven through cleat into each end of each batten.

Number of Pieces.—Sides and tops shall be one-piece stock, and bottom one, or two-piece stock if made of rotary-cut lumber not less than one-fourth inch thick. If two-piece sides and tops and three-piece bottoms are used, material must be at least one thirty-second inch heavier than one-piece stock, or wires spaced not more than 5 inches apart.

When resawed material is used in sides, tops, and bottoms it shall be one-sixteenth of an inch thicker than the rotary-cut lumber specified for one-piece stock.

Limitations.—There are limitations as to sizes, weights, and commodities that can be packed in wire-bound boxes. These limitations, however, can not be definitely fixed in any general specifications.

Standard Specification of the War Department for Export Packing in Boxes

Paper Lining.—Boxes shall be lined with waterproof case lining paper, over which shall be placed a lining of bogus or gray rag paper.

(*a*) *Specifications for Waterproof Case-Lining Paper.*—The specifications for waterproof case-lining paper are as follows: This waterproof case-lining paper shall be made of two layers or sheets of 100 per cent sulphate kraft paper, each layer weighing 30 pounds to the ream of 480 sheets, basis 24 by 36 inches, cemented together with not more than 30 pounds average weight of asphaltum to the ream. The basis of weight for the finished paper shall be 90 pounds to the ream of 480 sheets, basis 24 by 36 inches, with an allowable variation of 5 per cent above or below on the above basis, such variation, if any, to apply either to the paper or the asphaltum. The paper must be thoroughly waterproof, so that a receptacle made of a single piece shall hold water for 24 hours without wetting through. The strength shall be not less than 60 points on the Mullen tester.

(*b*) *Specifications for Bogus or Gray Rag Paper.*—The specifications for the bogus or gray rag paper are as follows: This bogus or gray rag paper shall weigh 90 pounds to the ream of 480 sheets, basis 24 by 36 inches, and the strength shall be not less than 15 points on the Mullen tester.

(*c*) *Method of Lining Box with Waterproof Case-Lining Paper.*—Boxes shall be lined with waterproof case-lining paper, either with sheets cut to the size re-

quired or with made-up containers or case liners of the correct size. If sheets cut to size are used, boxes shall be lined as follows: The bottom, sides, and top of the box shall be lined with a sheet of width not less than the interior length of the box, plus not less than 6 inches for lapping 3 inches around corners at each end of box, and of length sufficient to cover the bottom, sides, and top of box, and lap at least 6 inches on the top. Each end of box shall be lined with a sheet of width not less than the interior width of the box, plus not less than 6 inches for lapping around the corners 3 inches on each side, and of length not less than the interior depth of the box plus not less than 12 inches for lapping 6 inches on the top and bottom of the box. Thus, a box of interior dimensions, length 36 inches, width 17½ inches, depth 13 inches, shall be lined as follows: Bottom, sides, and top with a sheet 42 by 67 inches, and each end with a sheet 23½ by 25 inches.

(*d*) *Method of Lining Box with Bogus or Gray Rag Paper.*—The bogus or gray rag paper shall be so placed in the box that the waterproof paper lining is completely covered.

Box Strapping.—Boxes shall be strapped with cold-rolled unannealed steel band treated to prevent rust.

(*a*) *Width and Gauge of Strapping.*—The width and gauge of strapping to be used shall depend upon the gross weight of the box. On boxes up to 250 pounds gross weight the size of the strapping used shall be either ⅝ inch wide by 0.020 inch thick, or ¾ inch wide by 0.015 inch thick, ultimate tensile strength not less than 1,000 pounds. On boxes over 250 pounds gross weight to and including 400 pounds gross weight, the size of strapping used shall be either ¾ inch wide by 0.020 inch thick, or 1 inch wide by 0.015 inch thick, ultimate tensile strength not less than 1,200 pounds.

(*b*) *Point of Application of Strapping.*—All boxes shall be strapped on each end, strapping to be placed not less than 1 inch nor more than 3 inches from inside of ends of box. Boxes the length of which is greatly in

excess of the width or depth shall have one or more additional straps spaced equidistant between the end straps. When these are considered necessary they will be specified.

(*c*) *Stretching of Strapping.*—Strapping must be applied with some kind of stretching tool before nailing, so that it will be tight between nails and will not bulge over corners.

(*d*) *Nailing of Strapping.*—Strapping shall be nailed on as follows: Where it passes over the corners of the box it shall be secured by two four-penny cement-coated nails—one driven through the strap and through the top or bottom boards into the side boards, and one nail driven through the strap into the top or bottom boards. Between the corners of the box, strapping shall be secured with nails spaced approximately 2½ inches apart, and at least one nail shall be driven through the strap into each separate board of side, top and bottom. When the thickness of side, top and bottom is ⅝ inch, use ½-inch flathead nails; when the thickness of side, top and bottom is ¾ inch, use ⅝-inch flathead nails. When strapping 1 inch wide is used, the nails shall be staggered.

(*e*) *Joints of Strapping.*—Joints of strap shall lap at least 5 inches, and shall be so placed that the end of one overlapping piece shall be on the top of the box, approximately 2½ inches from corner, and the end of the other overlapping piece on the side of the box approximately 2½ inches from same corner. Each end of strap shall be secured by nail driven ¼ inch from end. The correct method of applying strapping is shown on drawing 76-11-9, with latest revisions, furnished upon request.

Style of Box.—Two styles of boxes shall be used:

Style A.—Having two cleats on each end, these cleats being vertical—i. e., at right angles to grain of ends.

Style B.—Having four cleats on each end.

Style A shall be used when the weight of contents is 100 pounds or less, or whenever the depth of the box is less than 12 inches.

Style B shall be used when the weight of contents

exceeds 100 pounds and the depth of box is 12 inches or more.

Surfacing.—It will be specified in each case whether box boards shall be S1S or S2S.[1] When S1S, the surfaced side shall be outside. Surfacing shall be well done, and no injurious sharp splinters or rough spots shall appear on surfaced boards.

Considerable economy will result from allowing ⅝-inch material to be S1S, since two thicknesses can be cut from nominal 1½-inch lumber, while ⅝-inch S2S sometimes requires 1-inch lumber for one thickness.

Joining.—All joints between boards shall be tongued and grooved or Linderman jointed. When tongued and grooved, boards must be tight matched. When Linderman jointed, the dovetail (or dovetails where double Linderman joint is used) shall be situated equidistant from opposite edges of the board.

Cleats.—Boxes having sides, top, bottom, and ends of group 1 woods may have cleats of any of the species listed. Group 2 woods are recommended for cleats.

Boxes having sides, top, bottom and ends of group 2 woods shall have cleats of woods of same group.

Cleats shall be 2 inches wide and of the same thickness as sides, tops and bottoms.

Nailing.—*A—Cleats to Ends.*—Cleats shall be securely nailed to ends with nails sufficiently long to pass through both thicknesses of lumber and clinch. At least two nails shall connect each piece of end to each cleat. Nails shall be placed as near the ends of cleats as possible, without splitting cleats. Intermediate nails shall be spaced approximately 2 inches along the length of the cleat. These nails shall be staggered.

B—Sides, top and bottom to ends.—Nails used shall be standard cement-coated box nails.

Proper size of nails depends on species and thickness of lumber holding points of nails after driving.

The following schedule shall apply:

[1] S2S should be specified when contents are such as to be damaged by abrasion on rough boards.

Classification of woods	Thickness of pieces holding points of nails after driving	Penny designation of nail	Length of nails to be not less than —	Average diameter of head to be not less than —
	Inch	*d.*	*Inches*	*Inch*
Group 1.....	¾	8	2 5/16	9/32
Group 2.....	¾	6	1 13/16	¼
Group 2.....	⅝	6	1 13/16	¼

Nails may be as slender as can be driven without bending or breaking, but must conform to the above schedule as to length. The head of the nail must be heavy enough not to be readily broken.

Spacing.—Nails connecting sides, top, and bottoms to ends shall be spaced as uniformly as possible. Spaces shall average not to exceed 2 inches. On edges where cleats are used approximately 50 per cent of the nails shall be driven into cleats. Top and bottom nails of sides shall be driven into cleats. Each piece of sides, top and bottom shall have not less than two nails at each end.

C—Top and bottom to sides.—Sizes of nails shall be in accordance with above schedule. Nails shall be standard cement coated box nails.

Nails shall be spaced at approximately 6-inch centers.

When box boards are Linderman jointed the requirement for two nails in each end of each side, top, bottom, and end board shall not apply.

Sealing.—When tops and bottoms are Linderman jointed they shall be considered as one piece and two seals only (one at each side) shall be used.

Screws in seal holes shall be 1½ inches by No. 8.

Screws must not be driven by hammer.

Size of Box.—The following diagram shows a list of the standard boxes of various sizes:

DIMENSIONS, DISPLACEMENTS AND WEIGHTS OF STANDARD BOXES

No. of standard box	Dimensions of Box									Displacement of box		Approximate weight of box	
	Interior			Exterior									
				Group 1 woods, ¾-inch lumber			Group 2 woods, 5/8-inch lumber						
	Length (inches)	Width (inches)	Depth (inches)	Length (inches)	Width (inches)	Depth (inches)	Length (inches)	Width (inches)	Depth (inches)	Group 1 woods ¾-inch lumber (cubic inches)	Group 2 woods, 5/8-inch lumber (cubic inches)	Group 1 woods, ¾-inch lumber (pounds)	Group 2 woods, 5/8-inch lumber (pounds)
1	21.5	8	8	24.5	9.5	9.5	24	9.25	9.25	2,211	2,054	14	15
2	21	9	10	24	10.5	11.5	23.5	10.25	11.25	2,898	2,710	16	18
3	17	11.5	10	20	13	11.5	19.5	12.75	11.25	2,990	2,797	16	18
4	41.5	14.5	5	44.5	16	6.5	44	15.75	6.25	4,628	4,331	26	30
5	26	15	9	29	16.5	10.5	28.5	16.25	10.25	5,024	4,747	23	26
6	22	18	12	25	19.5	13.5	24.5	19.25	13.25	6,581	6,249	29	33
7	37.5	14	10	40.5	15.5	11.5	40	15.25	11.25	7,219	6,863	31	35
8	26	19	12	29	20.5	13.5	28.5	20.25	13.25	8,026	7,647	31	35
9	37.5	14	12	40.5	15.5	13.5	40	15.25	13.25	8,475	8,082	35	40
10	22.625	22.5	14.25	25.625	24	15.75	25.125	23.75	15.5	9,686	9,249	34	38
11	36	17.5	13	39	19	14.5	38.5	18.75	14.25	10,745	10,287	39	44
12	49	16	9	52	17.5	10.5	51.5	17.25	10.25	9,555	9,106	40	45
13	44	15	15	47	16.5	16.5	46.5	16.25	16.25	12,796	12,279	45	51
14	46	26	9	49	27.5	10.5	48.5	27.25	10.25	14,149	13,547	52	58
15	41	21.5	15	44	23	16.5	43.5	22.75	16.25	16,698	16,081	55	62
16	47	20.5	14.5	50	22	16	49.5	21.75	15.75	17,600	16,957	58	65
17	37	26	15	40	27.5	16.5	39.5	27.25	16.25	18,150	17,491	57	65
18	48	21.5	15	51	23	16.5	50.5	22.75	16.25	19,355	18,669	59	66
19	40.5	25	16	43.5	26.5	17.5	43	26.25	17.25	20,173	19,471	58	66
20	37	22.5	20	40	24	21.5	39.5	23.75	21.25	20,640	19,935	61	68
21	34	29	25	37	30.5	26.5	36.5	30.25	26.25	29,905	28,983	76	86
22	36	17.5	7.25	39	19	8.75	38.5	18.75	8.5	6,484	6,136	30	34
24	16.5	17	9.5	19.5	18.5	11	19	18.25	10.75	3,968	3,728	19	21
25	24.5	14	8	27.5	15.5	9.5	27	15.25	9.25	4,049	3,809	20	23
26	21	16.5	12	24	18	13.5	23.5	17.75	13.25	5,832	5,527	25	28
27	50	14	15	53	15.5	16.5	52.5	15.25	16.25	13,555	13,010	48	54
28	44	21.5	11.5	47	23	13	46.5	22.75	12.75	14,053	13,488	48	55
29	26	22	11.5	29	23.5	13	28.5	23.25	12.75	8,860	8,448	33	37
30	31.5	20	10	34.5	21.5	11.5	34	21.25	11.25	8,530	8,128	33	39
31	28	8	8	31	9.5	9.5	30.5	9.25	9.25	2,798	2,610	17	19
33	28	9	8	31	10.5	9.5	30.5	10.25	9.25	3,092	2,892	17	20
34	24	26	12	27	27.5	13.5	26.5	27.25	13.25	10,024	9,568	36	40
35	27	7.5	7	30	9	8.5	29.5	8.75	8.25	2,295	2,150	15	16
36	34	11.5	10.5	37	13	12	36.5	12.75	11.75	5,772	5,468	26	30
39	36.5	26.5	6	39.5	28	7.5	39	27.75	7.25	8,295	7,846	38	43
40	41	20	10	44	21.5	11.5	43.5	21.25	11.25	10,879	10,399	41	46
41	39	27	10	42	28.5	11.5	41.5	28.25	11.25	13,766	13,189	48	55
42	29	20	10	32	21.5	11.5	31.5	21.25	11.25	7,912	7,530	32	36
43	44	16.5	12.5	47	18	14	46.5	17.75	13.75	11,844	11,349	43	48
44	33	16.5	11.5	36	18	13	35.5	17.75	12.75	8,424	8,034	34	38
45	33	13.5	9	36	15	10.5	35.5	14.75	10.25	5,670	5,367	26	29
46	35	11.5	11.5	38	13	13	37.5	12.75	12.75	6,422	6,096	28	32
47	26	18	12	29	19.5	13.5	28.5	19.25	13.25	7,634	7,269	30	34
48	19.5	18.125	16.5	22.5	19.625	18	22	19.375	17.75	7,948	7,566	32	36
49	41	12.75	12.25	44	14.25	13.75	43.5	14	13.5	8,621	8,222	35	39

How to Build a Box

Issued by the Safepack Mills

There are eight types of wooden boxes now in general use for shipping goods. Technically, a wooden box is any closed, rectangular wooden container with or without cleats, and it may be called either a "box" or a "case." They are the same. A crate, of course, may also be entirely closed or sheathed over, but it differs from a box in that it has an inside reënforcement of framework or bracing. There are also special types of veneer-panel, collapsible, and wire-bound boxes. The larger use, however, is for the eight types of standard nailed and lock-cornered boxes shown on Diagram I. Which of these types of box should be used for any commodity depends, of course, on the commodity itself, its character, weight and bulk and the destination of the shipment. But the rules which follow are an easy guide to selection.

Styles of Boxes

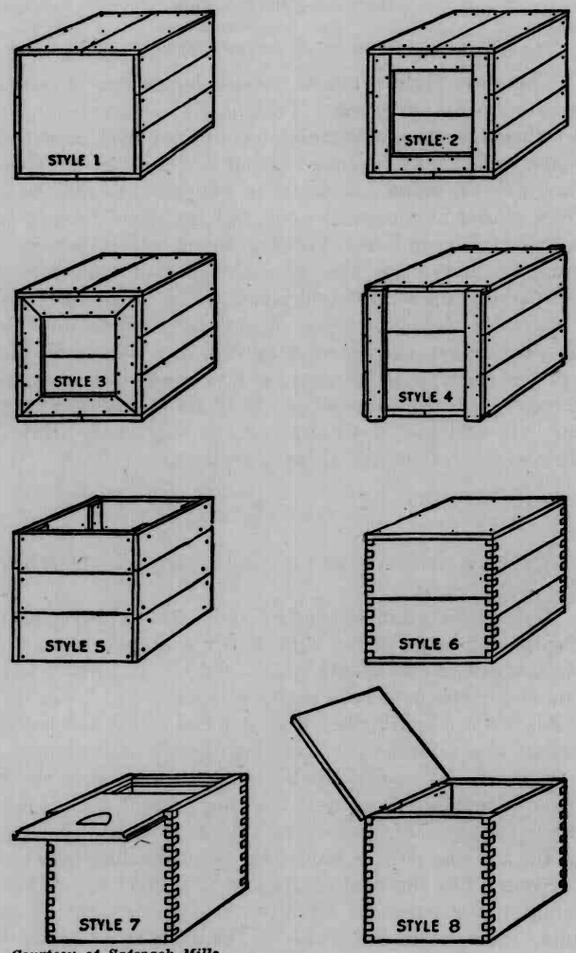
Style 1 is uncleated and is used mostly for small boxes with light contents.

Style 2 has double-cleated ends and is particularly adapted for large boxes with heavy contents, because of its strength due to cleats and to double nailing of sides, tops and bottoms to both cleats and ends.

Style 3 is a similar box with mitered cleats and heavier nailing, also adapted for large boxes with heavy contents.

Style 4 has single-cleated ends and is suitable for boxes of medium size and medium weight of contents. The sides have double nailing into both cleats and ends, but the top and bottom have only single nailing into ends.

Style 5 has internal cleats and is a good type of construction for boxes of medium size and weight of contents. Sometimes the width of the cleat is nailed to the end instead of to the side. Sometimes triangular internal



Courtesy of Safepack Mills.

Diagram 1

cleats are used in place of rectangular cleats. For articles such as round cans and odd-shaped articles which do not touch the corners of the box, considerable displacement in the container can be saved by the use of this style, because the cleats are inside and take up space otherwise unoccupied.

Style 6 is a plain lock-cornered box and is adapted for boxes of medium size and medium weight of contents.

Style 7 is a similar lock-cornered box fitted with a sliding cover.

Style 8 is a similar lock-cornered box equipped with a hinge cover.

Styles 1 to 6 are mostly used, styles 7 and 8 being used as a rule for more or less special products.

Lumber

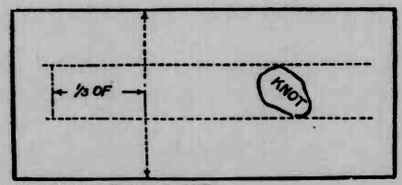
Both tests and actual use have thoroughly demonstrated that satisfactory boxes can be made of practically any of the commercially important woods.

Knots, Knot Holes, Decay, Worm Holes and Checks.—The lumber used in the box should also be sound—free from decay, dote and injurious insect or worm hole—and should contain no knots or knot holes large enough to seriously affect the strength of the box.

It is difficult to set an arbitrary maximum for size of knots or knot holes which will be satisfactory in all instances. The degree to which a knot weakens a board depends not only upon the size of the knot, but also upon its position in the board and upon whether it is a loose, decayed or sound knot. Knots or knot holes in the center of a box board are generally more weakening than knots or knot holes near the ends, and a loose or rotten knot is generally more weakening than a sound knot.

The War Department specifications for export boxes permitted no knots larger than one-third the width of the board, measured as in Diagram 2, and permitted no knot holes or loose or rotten knots greater than one inch in diameter, measured as in Diagram 2. These speci-

fications worked out very satisfactorily and did much toward improving the quality of army boxes. It has been said by some that this is too stringent a specification for commercial export or domestic boxes, because it requires too expensive construction. Possibly this is true, but it should be borne in mind that in many cases better commercial export and domestic boxes are badly needed, and better box lumber will assist greatly in improving them.



Courtesy of Safepack Mills.

Diagram 2. Method of measuring knot.

Boxes which must be tight because of the nature of their contents should be made of lumber free from knot holes and loose or rotten knots. No knots should be permitted in any box which interfere with proper nailing. Large checks or splits are objectionable, because they weaken the board and should generally not be admitted unless reënforced with corrugated fasteners driven across the opening.

Thickness and Width.—Probably no other factor is of as much interest to the box industry as the thicknesses and the widths of lumber which are specified. Because of the high cost of the upper lumber grades, the box industry is compelled to use the lower grades which contain knots and other defects. These defects are cut out in resawing the boards, the amount of cutting necessary and the waste resulting depending upon the grade of lumber used and the grade of box desired. Under ordinary conditions the waste in cutting out defects runs from 15 to 20 per cent.

The rough thicknesses available are generally 1″, 1¼″, 1½″ and occasionally 2″, and the available widths range from 3″ and 4″ up to 12″. It should be borne in mind, however, that although the available widths run up to 12″ or sometimes higher, by far the larger per cent of material available runs from 4″ to 6″ or 8″.

The specifying for boxes of thicknesses and widths which cannot be produced by the box maker without a large amount of waste decreases the production of the box factory, increases the cost of the box and in most instances accomplishes no particular purpose. For the sake of economy, therefore, the standard and more common thicknesses and widths should be adhered to.

Rule for Thickness.—The particular thickness of lumber required for a box depends upon whether the box is for domestic or export shipment, and also upon the character, size and weight of the contents. It is, therefore, impossible to lay down a general rule regarding thickness which will apply in all cases.

Boxes of a gross weight of less than 100 lbs., such as boxes for canned goods and boxes for shoes and soap, are often made of lumber of less than commercial 1″ thickness, using ⅜″, ½″ or ⅝″ thickness, according to the standard practice. These thicknesses are resawed from 1″, 1½″ and 2″ thicknesses.

Boxes of a gross weight of from 250 to 500 lbs., either for domestic or for export shipment, especially those of large size, should generally be made of heavier lumber than 1″ thickness, using commercial 1¼″, 1½″ and 2″ thickness, according to conditions.

Boxes for export, in most cases, should be made of thicker material than boxes for domestic shipment owing to the increased hazards of transportation to which they are liable to be subjected. The thickness required for export boxes may exceed the proper thickness for domestic shipment by from 10 to 50 per cent, or even more, according to conditions. During the war the U. S. Army found that for hardware, textile materials, leather goods, mess equipment and similar material, where the gross

weight of the box and contents did not exceed 250 lbs. and the cubic displacement 17 cubic feet, boxes made of standard commercial 1-inch lumber with cleated ends, constructed and strapped according to the specifications which follow, were of sufficient strength for both domestic and overseas shipment.

It is possible to construct a box for almost any size and weight of contents, but in general, boxes for articles of very large size and weight are not economical, because they must be made of lumber of excessive thickness in order to have the required strength. Crating of large heavy articles is much more economical than boxing, as considerably less lumber can be used by making a heavy crate framework of sufficient strength to carry the article, anchoring the article to it, and if necessary, covering the framework with thin 1″ sheathing.

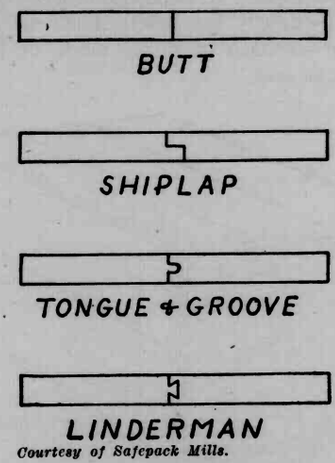
It has been conclusively proven that boxes which are well strapped with steel strapping require thinner lumber than boxes which are unstrapped. The great value of strapping has not been fully realized, and its use is worthy of very careful study, both from the standpoint of economy in packing, enabling the use of thinner lumber and also from the standpoint of increased strength of container.

Rules for Width.—Boxes with one-piece sides, tops, bottoms and ends are generally stronger and more desirable than boxes where sides, tops, bottoms and ends are composed of more than one piece. Except in the case of small boxes, it is generally not practical to use one-piece stock entirely, because of the difficulty of securing wide boards and because of their cost. It is advisable, however, to use as wide boards as possible, because of the difficulty of properly nailing boards of less than 2½″ face width. Also large boxes made of a number of narrow boards are very apt to shear along the joints between the boards when dropped on a corner of the end, causing the ends to get out of plumb, greatly weakening the box.

Bearing in mind the available widths of lumber and also the relation of widths of different size to the strength

of the box, the rules for width were worked out by the War Department.

The box maker is always anxious to use up his narrow stock so as to reduce his waste, and boxes are often made which contain boards 1½″ or even 1″ wide. However, the minimum face width of boards should never be less than 2½″, as it is necessary in properly nailing a box that each separate piece of sides, top and bottom have not



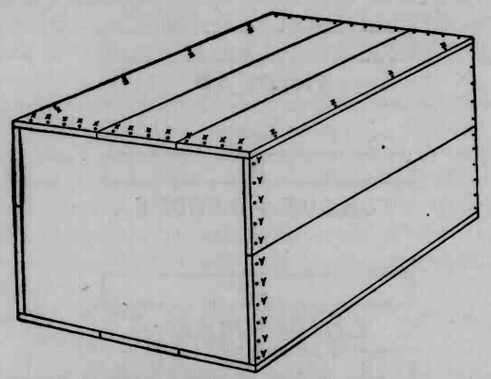
Courtesy of Safepack Mills.

Diagram 3. Four usual methods of joining boards in box making.

less than two nails at each nailing end, and it is impossible to successfully drive two nails into the end of a board less than 2½″ in width.

Surfacing.—In general, boxes, especially small ones, should be surfaced on the outside, because rough boxes are very difficult to handle without getting splinters in the hands, and they are difficult to stencil or mark properly. Whether or not the box should be surfaced on the inside depends upon the liability of the contents to injury by abrasion on rough boards.

It is often more economical to make a box of boards which are surfaced only on one side, as they can sometimes be resawed from thicker boards with less waste than boards which are surfaced on two sides. For instance, in the case of 5/8" lumber, two 5/8" thicknesses can generally be resawed from commercial 1 1/2" lumber when the boards are surfaced on one side, while it may require full 1" lumber for one 5/8" thickness when the boards are surfaced on two sides. In some instances, there is also the question of slightly increased thickness and the resulting greater strength of boxes made of lumber surfaced only on one side.

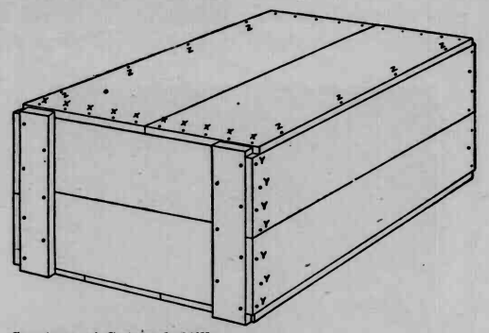


Courtesy of Safepack Mills.

Diagram 4. Proper method of nailing an uncleated box.

Joining.—The more common methods of joining box boards are shown in Diagram 3. Where the nature of the contents demands a tight box for protection against moisture and dust it is advisable to use either a tongued and grooved or a Linderman joint. The use of these joints also increases the strength of the box, as the individual boards assist each other in resisting the impact of blows which tend to puncture the box. When the Linderman joint is used, the dovetail tongue—or tongues

where the double Linderman joint is used—should be situated equidistant from the opposite edges of the board. Where butt joints are used in box ends 1" or less in thickness, it is advisable to fasten each joint with not less than three corrugated fasteners, two driven from one side near the ends and the other driven from the opposite side, midway between the other two. The use of corrugated fasteners in butt joints in sides, tops and bottoms will also greatly increase their strength. It is also advisable to break joints between boards in sides and ends of box to eliminate the weakening effect of a continuous joint clear around the box.



Courtesy of Safepack Mills.

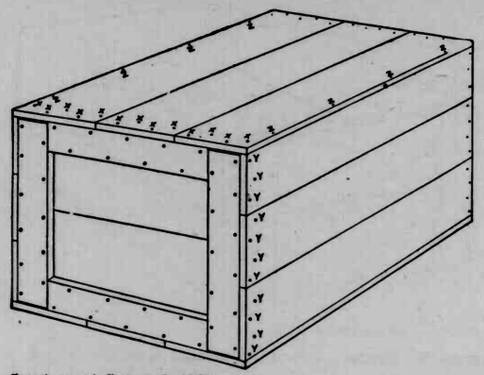
Diagram 5. Proper method of nailing a single-cleated box.

Cleats.—Ends one inch or less in thickness composed of more than one piece and not reënforced in the joints with corrugated fasteners as specified above, should be cleated. The cleats on export boxes should, as a rule, not be less than 2" wide and should not be less than 5/8" thick. In general, cleats and ends are of same thickness.

Boxes whose sides, top, bottom and ends are made of woods listed in Groups 1 and 2 may have cleats made of any of the woods listed in the four groups. Boxes whose sides, top, bottom and ends are made of woods listed in Groups 3 and 4 should have cleats of woods from Groups 3 and 4 woods.

In making Style 4 boxes, care should be taken that the cleats be cut a little shorter than the over-all height of the box, so that the ends reach slightly below the top and bottom surfaces of the box. If the cleats project even slightly above the top and bottom surface, they are very liable to be loosened or torn off in handling the box.

The value of cleats lies in the reënforcing which they give the end of a box by tying it together and reducing to a minimum the dangerous effects of splitting the box end. There is great advantage also in the increased nailing surface which they afford for nailing sides, tops and bottoms, with consequent added strength to the box. Boxes



Courtesy of Safepack Mills.

Diagram 6. Proper method of nailing a double-cleated box.

with heavy contents and boxes of great depth should, as a rule, have cleated ends, because of the great added strength afforded by the cleats.

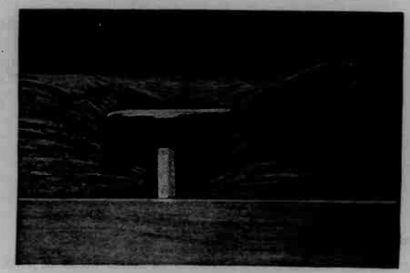
Nails and Nailing

The manner in which a box or case is nailed is of extreme importance. The size and quality of wood may be just right, but the strength of the box and the safety of its contents will depend largely on the nailing. A box

is only as strong as its nail-holding power. Tests have shown that a few correctly placed nails will sometimes increase the strength of a box 100 per cent.

All nails with the possible exception of nails driven through cleats and clinched should be standard cement-coated box nails, for cement-coated nails have from 10 to 30 per cent. more holding power than plain nails and greatly increase the strength of the box. They are also of lighter gauge than plain nails and cause less splitting in driving, and being lighter in gauge they are cheaper, for there are more of them to the pound.

Nailing Outside Cleats to Ends.—Cleats should be securely nailed to ends with nails sufficiently long to pass through both thicknesses of lumber and clinch at least ¼



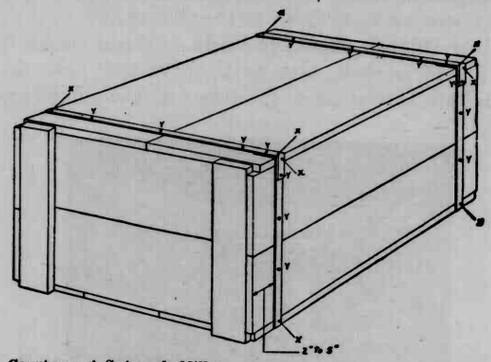
Courtesy of Safepack Mills.

Diagram 7. Bad effect of overdriving a nail.

of an inch. At least two nails should connect each separate piece of end to each cleat, and nails at top and bottom of cleats should be placed as near the ends as possible without splitting the cleats. Approximately the same number of nails should be used in nailing cleats to ends of box as are used in nailing the adjacent side, top or bottom to the end. Nails should be spaced evenly along the cleat and should be staggered, care being taken to place the nails as close to the edge of the cleat as possible without splitting it. Diagrams 5 and 6 show the correct way to nail cleats to the ends of a box.

Nailing Sides, Top and Bottom to Ends.—The gauge or size of nails to be used here is determined by the thickness and by the species of the ends or cleats in which the *points* of the nails are held after driving. A general rule worked out by the Forest Products Laboratory is as follows:

When the box end or cleat is of woods listed in Groups 3 and 4 the penny of the nails should be the thickness of the end or cleat expressed in eighths of an inch. Ends or



Courtesy of Safepack Mills.

Diagram 8. Steel strap located in from ends of box.

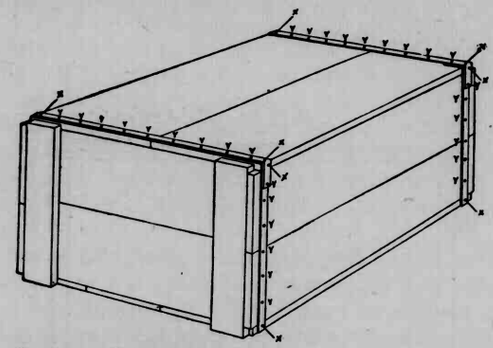
cleats of woods in Groups 1 and 2 should take the next penny larger.

This is a good general rule, but the Forest Products Laboratory has recently worked up a nailing schedule for boxes up to ⅞″ in thickness which gives better nailing in individual cases. (See Capt. Knowlton's chapter on this subject.)

For export boxes the spacing of the nails should be as follows: Six-penny nails and nails smaller than 6-penny should be spaced not more than 1½″ apart when driven in the side grain of the end (see nails marked "X" in Diagrams 4, 5 and 6) and not more than 1¼″ apart when

driven in the end grain of the end (see nails marked "Y" in Diagrams 4, 5 and 6). In the case of nails larger than six-penny, the spacing in end construction should be increased over these sizes one-fourth of an inch for each penny over six.

Nailing Top and Bottom to Sides.—The spacing of the nails should be six inches or more apart when nails are six-penny or smaller (see nails marked "Z" in Diagrams 4, 5 and 6). For nails larger than six-penny increase the spacing one inch for each penny over six.



Courtesy of Safepack Mills.

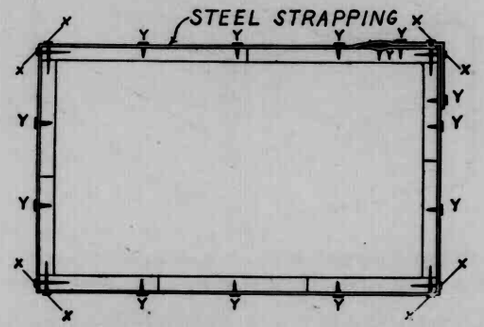
Diagram 9. Steel strap applied at ends of box, directly over nailing.

Driving of Nails.—The heads of the nails should be heavy enough not to be broken in driving, and nails with large heads are preferable to nails with small heads, as they are less liable to pull through the boards.

In all cases care should be taken not to overdrive nails. Nails should be driven so that heads are just flush with the surface of the boards, because when the heads of nails are driven below the surface of the boards the wood structure is broken down, and the holding power of the nail is greatly decreased, as Diagram 7 shows. No nails should be driven into joints.

The Lock-Cornered Box

A large part of the efficiency of the lock-cornered type of box depends upon the strength of the lock-cornered joint, and, therefore, care should be taken to make the joint properly. Locks at corners should fit tightly, and great care should be taken to thoroughly glue the locks with a good grade of glue. The strength of the lock-cornered joints can be greatly increased by driving a long thin finishing nail down through two or three of the locks at each of the eight corners.



Courtesy of Safepack Mills.

Diagram 10. Section of strap-bound box shown in Diagram 8.

Wherever possible sides and ends should be of one piece. When sides and ends are made of more than one piece, great care should be taken to break the joints between boards in the sides and ends at least 1", and preferably 1½", if possible. If this is not done the box is liable to split in two at the joints between the boards.

For nailing the top and bottom of lock-cornered boxes

to the sides, the same rule applies as in the case of nailed boxes.

Metal Strapping of Boxes

There is no other means which will strengthen a box so greatly as reënforcing it with steel strapping. Tests show that it is possible to increase the strength of a box 100 per cent or even more by the proper application of steel strapping. Also thinner lumber can be used and the cost of the box reduced, and in addition strapping is of great assistance in preventing the pilfering of boxes.

It is good export practice to strap all boxes for overseas shipment, no matter what their size, weight or destination. If strapping were also used to a much greater extent on domestic shipments, it would go a long way toward reducing the damage claims paid by the carriers for broken and pilfered boxes. Also the required strength of a container can be secured much more cheaply by the proper use of steel strapping than by lumber of excessive thickness.

Types of Strapping.—The two most common types of strapping are flat steel band strapping and single or twisted wire strapping. There are also efficient special patented types of nailless strap and wire. For all-around use, however, there is no better strap than flat band, cold rolled, unannealed steel strap, coated to prevent rust, if it is properly stretched, properly located on the box and properly nailed.

Unannealed flat band strapping makes a stronger binding than annealed, for the unannealed strap possesses by actual test over 30 per cent more tensile strength than the annealed. Also it usually does not cost any more. The tensile strength of a strap is its most important quality, as most strap fails by a direct tensile strain or by a tear. When a box dries out it shrinks and the strap loosens between nails, causing it to bulge away from the box. Then, when the box is handled in freight cars, on the docks, in the hold of a ship or in the ware-

house the strap often catches on nails or other projections and tears or breaks.

Annealed strap because of its low tensile strength is consequently much more liable to tear or break than unannealed strap. Also the annealed strap possesses considerable ability to stretch, which is another undesirable quality. The annealed strap nails somewhat easier than the unannealed, but in the gauges used for ordinary boxes there is no difficulty in nailing the unannealed strap.

Location of Straps.—Boxes are strapped in two different ways: with the strap directly over the ends of the box, as shown in Diagram 9, and with the strap a slight distance in from the ends, as shown in Diagram 8.

The location of the strap slightly in from the ends of the box as shown in Diagram 8 gives a tighter binding, especially on boxes which are long, than strap applied directly over the ends, because in this position it better prevents the bulging of the side, top and bottom boards, which causes the nails in the end to start. However, on boxes whose sides, top and bottom are less than ⅝″ in thickness it is somewhat difficult to nail the strap when applied in from the ends, because of the thinness of the boards. The distance which the strap should be in from the ends will vary with the size of the box and the weight of the contents, but will generally be somewhere between 2″ and 5″. Nailless strap and wire are always applied in from the ends of the box, being drawn tight by a stretching tool and the ends either sealed with a seal for flat band strap or twisted if wire strap is used.

Strap applied directly over the ends of the box is generally easier to apply than strap applied in from the ends, because the ends of the box afford a firmer nailing surface and not so much care has to be exercised in nailing. Strap located on the end of the box not only assists in binding the sides, top and bottom boards to the ends, but also serves to prevent the nails in the side, top and bottom boards from working out.

Stretching and Nailing.—The stretching of the strap is of the utmost importance, for a loose strap loses most

of its efficiency as a binding, and the tighter the strap the less it will bulge when the box shrinks. There are a number of tools on the market which stretch the strap well and are simple to use.[2]

Diagrams 8 and 10 show the correct way to nail strapping when located in from the ends of the box with double corner nails "x" and small flatheaded nails "y" holding the strap to the side, top and bottom of the box, spaced about 6″ apart. With ½″ strap it would probably be difficult to place two nails at the corners as shown at "x," in which case one nail should be used driven through the strap and through the top or bottom board into the side board. The lap of the strap should be at the corner, as shown, a nail being driven close to the end of the strap so as to hold the end down firmly.

The double corner nails "x" hold the strap securely against a pull in either direction, and the intermediate nails "y" keep the strap snug against the box and prevent it from bulging. Four-penny cement-coated nails are generally large enough for the corner nails "x," and the intermediate nails "y" should be short, flatheaded nails of length slightly less than the thickness of the sides, top and bottom. All nails should be cement coated.

Strapping located directly over the ends is nailed with double corner nails "x" (see Diagram 9). The intermediate nails "y," however, are the same size and length as the nails "x" and are generally spaced about 3 or 4 inches apart.

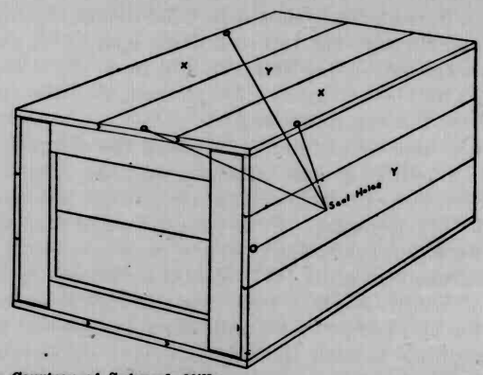
Pilfering

Many million dollars worth of goods are lost each year by pilfering, both in domestic and export shipment.

[2] Instructions issued by the General Engineer Depot of the Army read: "Each case will be firmly bound with unannealed cold rolled strip steel. Ends should lap at least four inches. Bands shall be drawn tight by mechanical means; the use of a hammer claw and driving a nail on a slant and then straightening it up are not satisfactory; the joint shall be on the side of the box or crate. Bands shall preferably be put on as late as may be before shipment, to minimize the effect of shrinkage."

Of course, no wooden box can be made so strong that it cannot be broken open. A box can be so sealed, however, that it is difficult for a thief to get into it without a good deal of trouble and without it showing the effects of tampering. Well applied strapping assists greatly in preventing pilfering, although an experienced thief can often get into a strapped box and seal it up again so that it is difficult to see that it has been tampered with.

There are a number of patented safety clips on the market which are very efficient in preventing pilfering.



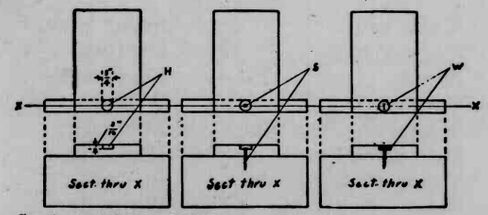
Courtesy of Safepack Mills.

Diagram 11. Method of sealing box to prevent pilfering.

One of the most efficient methods, however, is to use a tongued and grooved box and to seal the top, bottom and side boards of the box to the sides and ends by means of countersunk screws and sealing wax. Each separate board of the top and bottom and center boards of the sides should be sealed, with seals located as shown in Diagram 11. The seal on the outside top or bottom boards "x" should be on alternate ends about 8" from the end of the board. The center boards "y" should each have one seal at the end.

The seal is made as shown on Diagram 12. A hole "H" is bored ¾" wide by 3/16" deep, care being taken

that the hole does not break the edge of the board. A screw "S" of length equal to twice the thickness of the top, bottom or side boards of the box is then driven through the top, bottom or side boards down into the side or end of the box. After the screw has been tightly driven, hot sealing wax "W" is poured into the hole "H" so that it is about two-thirds full. While the wax is still hot it is stamped with the manufacturer's initials "I," the trademark or other distinctive mark. Care should be taken not to pour the hole clear full of wax, as the wax is then liable to be broken by other boxes sliding over it.



Courtesy of Safepack Mills.

Diagram 12. Cross section showing method of preventing pilfering.

With a box sealed in this manner the top and bottom boards cannot be removed without breaking the wax seal to remove the screws, after which the box would show the effects of tampering. This is the standard method of sealing used by the War Department.

Standard Crating Specifications of the War Department

A crate consists of a frame with or without bracing. It may be of open construction or completely closed with sheathing. The lumber must be sound (free from decay and dote), well manufactured and well seasoned. Frame and bracing must be free from knots greater than one-fourth the width of the face, and sheathing material must

be free from knots greater than one-third the width of the boards. No knot shall be permitted that interferes with the nailing.

For these specifications well-seasoned lumber has an average moisture content of 12 to 18 per cent., based on the weight of the wood after oven drying.

The principal woods used for framing and for frame bracing and sheathing are grouped as follows:

FRAMES AND FRAME BRACES

Group 1

White pine.	Sugar pine.
Norway pine.	Cypress.
Aspen.	Basswood.
Spruce.	Willow.
Western yellow pine.	Noble fir.
Cottonwood.	Magnolia.
Yellow poplar.	Buckeye.
Balsam fir.	White fir.
Chestnut.	Cedar.
Butternut.	Alpine fir.
Redwood.	Lodgepole pine.
Cucumber.	

Group 2

Southern yellow pine.	Virginia and North Carolina pine.
Hemlock.	Oak.
Elm.	Hackberry.
Red gum.	Douglas fir.
Sycamore.	Larch.
Ash.	Black gum.
Maple.	Tupelo.
Beech.	Birch.

Sheathing.—Any species of wood may be used for sheathing.

Thickness of Material.—When woods used for frames and braces in Group 1 are 1 to 2 inches thick, woods in Group 2 may be one-fourth inch less in thickness; when woods in Group 1 are more than 2 inches thick, woods in Group 2 may be one-half inch less in thickness.

Sheathing material of wood shall be approximately thirteen-sixteenths inch thick.

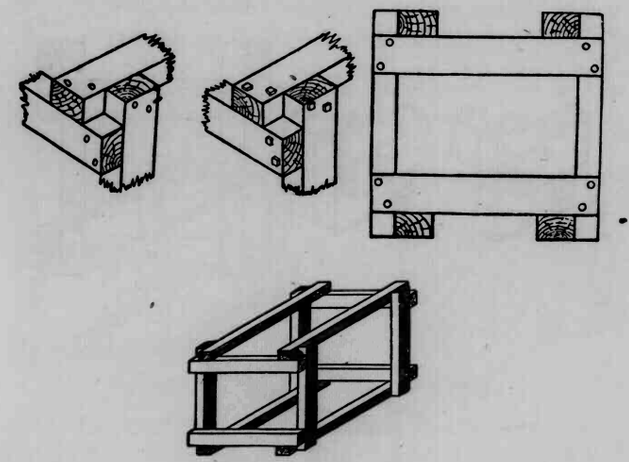


Figure 1

Widths of Lumber.—Pieces less than 3 inches wide shall not be used in frames or frame braces. Pieces less than 2½ inches wide shall not be used in sheathing.

Nails.—All nails 20-penny or less shall be standard cement-coated box nails.

In frames, frame braces and sheathing the thickness of the member to be nailed on determines the penny of the nails used. In frame and frame braces the length of the nail should not be less than twice the thickness of the member nailed on. In sheathing the nails should be two-

penny larger than the thickness of the member expressed in eighths of an inch.

Spacing Nails.—Frames and braces shall not have less than two nails in each nailing edge. Nails in bracing and sheathing are to be staggered, approximately 2½ inches apart. Cross braces must have not less than two nails driven through the two pieces, and these must be clinched where possible. Bracing should have as many nails as can be driven without splitting either member.

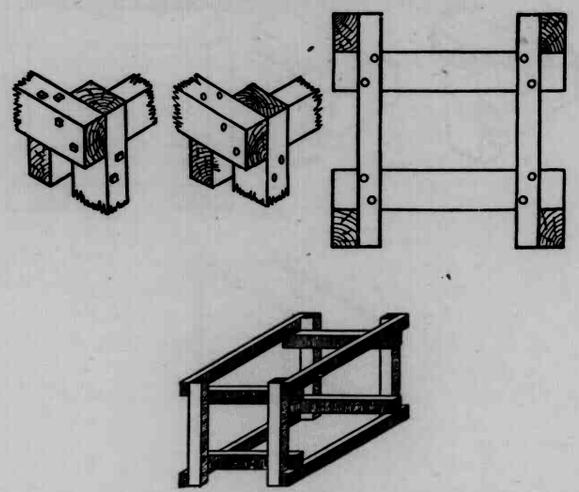


Figure 2

Bolts.—Bolts shall be used on heavy frame pieces, not less than two bolts to each framing edge (see Fig. 1). Standard cut washers shall be used under boltheads and nuts, except under heads of carriage bolts. Holes for bolts shall be the same diameter as the bolts. Carriage bolts shall be used in preference to machine bolts. Not less than ⅜-inch bolts shall be used for frames 1 to 1½ inches thick; ½-inch bolts in frames up to 3 inches thick; ⅝-inch bolts in frames over 3 inches thick.

Contents shall be bolted to skids with not less than four bolts where feasible, the size of the bolts to be determined by the holes in the machine base. When machine bolts are used, heads shall be counterbored flush with skids, and each bolt shall have a single-cut washer of standard size. The thread of bolts shall be upset close to the nut, so that the nuts will not work loose in transportation. To remove the nuts split them if necessary.

Designs of Crates and Crate Bracing

The preferred design of crate construction is the three-way corner construction end, in which are placed

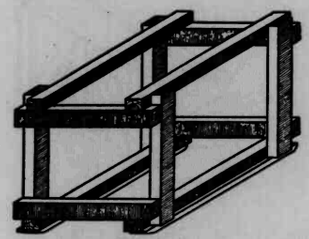


Figure 3

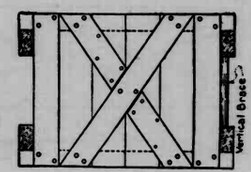


Figure 4

on the inside of the longitudinal members either the vertical or horizontal end members, whichever conserves the greater space. (See Figures 1 and 2.)

On heavy articles skids should be at least 50 per cent thicker than the other members of the frame, the additional thickness to be in a separate piece bolted to the skids and extended to meet the vertical members. (See Fig. 3.)

Combined thickness of the cross braces shall equal the thickness of the frame members. (See Fig. 4.)

In angular crate bracing a cross member shall be placed so as to bring the angular brace as near 45° as possible. (See Fig. 5.)

On all heavy material each side of crate shall be marked so as to show the center of gravity, and the skids

shall be slotted on each side far enough apart to admit of proper handling. Slots shall be at least 2 inches deep by 8 inches long, so that when the crate is being slung the hook on the hoisting point will span equally the center of gravity. (See Fig. 6.)

Internal Bracing

Cleats of suitable length and thickness shall be used and shall be nailed or bolted to the skids at the base of contents so as to prevent longitudinal movements. All internal cleats and bracing, so far as possible, shall be

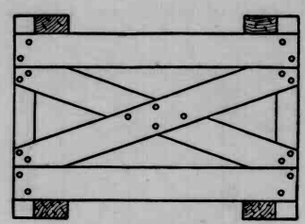


Figure 5

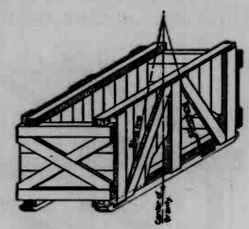


Figure 6

so placed that the compression stress is against the end grain of the wood. (See Fig. 7.) When contents have no base holes for bolting to skids, clamps must be placed at each end or side, fitted snugly to the load, and held in place by one bolt at each end. The clamps shall be full width of crate and of such square dimensions as will admit of no springing when bolts are drawn home. Such contents shall also have side cleats to prevent lateral movement.

Space for Marking.—Some members of the crate shall be surfaced to permit adequate space for markings.

Exceptions to General Specifications

In the designing of crates for the protection of contents the information given, with the explanatory drawings, is of a general character and covers in a general

way all the material to be handled. There are, however, many exceptional cases where the material to be crated is of such a nature that it may be necessary to depart from these rules. All manufacturers contributing material for Government uses should remember that conditions under which this material is handled are probably very much rougher and that the facilities for handling it are fewer than ordinarily is the case in export service. While the nature of the contents indicates the manner in which it is to ride, whenever possible material should be packed so that the packages will rest safely on side, top, bottom or end.

Strapping on Crates.—In the use of strapping on crates there are so many forms, with such varied uses and functions, that it is not practical to lay down any

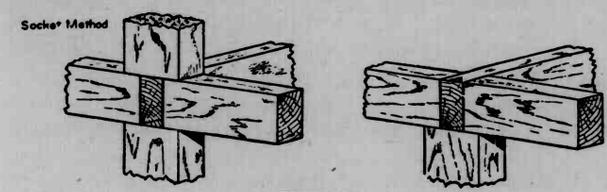


Figure 7

fundamental rules to govern; yet straps are absolutely essential in certain cases, and must not be omitted in those instances, particularly at corners and at joints.

Standard Baling Specifications of the War Department

Size of Bale.—Bales shall be made to conform to the following standard size: Length, 30 inches; width, 15 inches; height, variable, but approaching 15 inches as nearly as possible, but not being less than 14 inches nor more than 19 inches; gross weight, 70 to 140 pounds.

The only exception to this rule will be when the material to be baled is of such size and weight that it is

impossible or impracticable to make it into a bale of this standard size and weight.

Number of Articles per Bale.—The purpose in baling is to pack the maximum number of articles in the minimum of space without damaging them.

Methods of Folding and Forming Articles in Bales.—Care should be taken in folding and forming that articles will produce neat, uniform and compact bales; care taken that joints be broken to avoid cutting of covering by straps.

Covering.—Bales shall be covered with burlap of weight not less than 10 ounces to 40 inches in width.

For the standard bale 30 by 15 by 14 to 19 inches, two pieces are required, each piece 50 by 40 inches wide. Larger sizes require correspondingly larger pieces.

Interlining Paper.—Each bale shall have underneath the burlap a lining of waterproof paper.

The interlining paper shall conform to the following specifications:

60/60 Waterproof Kraft Wrapping Paper for Baling

Weight.—Shall be not less than 330 pounds. (Two sheets 60-pound Kraft duplexed with asphaltum.) 36 × 50 — 480 (24 × 36 — 480, 160 pounds).

Stock: Shall be 100 per cent sulphate pulp.

Bursting strength: Shall be not less than 140 points. Bursting strength after exposure of the waterproofed side to 3 inches of water for three hours shall not decrease more than 25 per cent.

Water Resistance.—The paper shall not wet or dampen through in 10 days.

Waterproofing.—The paper shall be duplexed with and one surface waterproofed with asphaltum or its equal. The paper shall be flexible, but not tacky under ordinary weather conditions where a duplex paper is used.

Cohesion.—The plies shall not separate under service conditions.

Basis of Purchase.—For 1,000 sheets 36 by 50.

Explanation of Tests.—Bursting strength is determined with the Mullen tester or testing machine giving equivalent results, the paper clamped with the waterproofed side up. Water-resistance test to be made with a column of water 3 inches in height after the paper has been crumpled in the hand.

For the standard bale 30 by 15 by 14 to 19 inches, experience has shown that it is desirable to have at least two sheets, each sheet 50 inches long and 36 inches wide. Larger sizes require correspondingly larger sheets. The sides of bales should be reenforced when necessary with fiber boards, ⅜-inch slats, or other light material, to add protection and rigidity.

Banding.—The banding shall be of cold-rolled unannealed steel ⅝ inch wide, not less than No. 26 gauge. It shall be painted or coated to prevent rust and shall have a tensile strength of not less than 850 pounds.

Not less than four bands shall be used on each bale. The two outside bands shall be placed approximately 4 inches from each end, and the intermediate bands shall be placed equidistant from each and from the end bands.

Bands shall be applied by a mechanical stretching tool and must be stretched so tightly that the compression of the bale will be held and that the bands will remain in place and not slip off over the ends of the bale.

Sealing of Bands.—The ends of bands shall be sealed with a metal sleeve or seal designed to be either punched or crimped. The breaking strength of the sealed joint shall not be less than 50 per cent of the breaking strength of the strapping.

Loose ends of bands shall be folded under, cut round, cut or broken off so that no spider is left projecting.

Sewing.—The burlap shall be sewed up with three-ply linen or twine of equal quality of not less than 40 pounds tensile strength. Bales shall be sewed sides and ends, and each stitch shall be knotted, and stitches shall be not less than 2 inches in length.

Ears.—Not less than 5 inches of surplus burlap shall

be gathered together on each of the four corners and securely sewed into "ears" for handles. All ends of twine shall be securely fastened.

Stenciling.—Stencil black, United States Army standard, must be used, and the marking shall be in letters or figures as large as possible.

Standard Specifications of the War Department for Marking Packages

No advertising matter shall appear on packages.

Stenciling is preferable to hand marking. The height of letters shall conform to the size and character of package, but shall not be less than ¾ inch. When marking with stencils, use only United States Army stencil black standard paint of the following composition:

Pigment, 50 per cent.
Liquid, 50 per cent.
Pigment shall consist of:
Drop black, 50 per cent.
Calcium carbonate, 50 per cent.
Liquid portion shall consist of:
Varnish, 70 per cent.
Combined dryer and thinner, 30 per cent.

The thinner shall consist of turpentine or volatile mineral spirits or a mixture thereof.

The varnish should be a clear spar varnish. For bales or crates use the standard system of marking. For marking machinery carts, structural steel, or similar commodities, use United States standard paint, either white or of the corps color.

"Tests and Suggestions for the Nailing of Boxes"

By J. A. Newlin in "The Barrel and Box"

"The purpose of nailing a box is to hold it together and give it rigidity. To use more nails or larger nails than are necessary to accomplish this purpose is a waste

of both material and labor. To use fewer nails than are necessary to hold properly under ordinary conditions results in breakage of the box and damage to the contents.

"Tests at the Forest Products Laboratory of the United States Forest Service, at Madison, Wis., and observations of packages in transit and at their destination, have shown conclusively that where the nailing is insufficient the package cannot be improved by putting in heavier lumber. Observation has shown also that the

Figure 9. Shrinking of fibers from driven nail.

majority of failures in ordinary boxes are due, not to the lumber but to the nailing. It is also evident that in many instances a better package could be obtained with much thinner material by the use of a few more nails.

"In arriving at the proper nailing there are a number of factors that must be considered. These involve the nail, its length, diameter, and surface, and the species of wood, its thickness and condition.

"It is desirable to know whether the nail should be smooth, barbed, or cement-coated. Our tests have shown that at least in the ordinary sizes, barbed nails are not

INTENTIONAL SECOND EXPOSURE

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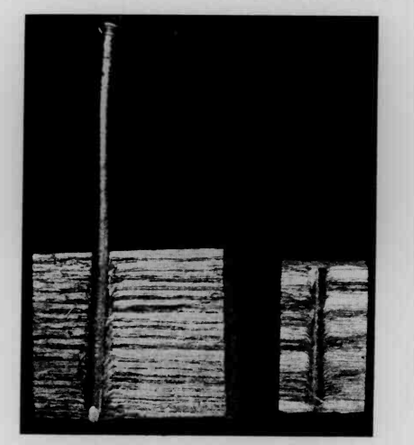

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"In arriving at the proper nailing there are a number of factors that must be considered. These involve the nail, its length, diameter, and surface, and the species of wood, its thickness and condition.

"It is desirable to know whether the nail should be smooth, barbed, or cement-coated. Our tests have shown that at least in the ordinary sizes, barbed nails are not

so efficient in box construction as smooth ones. Apparently the ability of the barbs to increase the resistance of the nail to withdrawal is more than offset by their tendency to tear the wood. Cement-coated nails have given uniformly better results than smooth nails, although different lots of cement-coated nails have shown greater variation in efficiency than smooth nails. The holding power of the cement-coated nail is from 10 to 30 per cent greater than that of the same sized smooth nail. On an average, a box built up with the cement-coated nails will withstand about one and one-half times as much rough handling as a box made with the same number and gauge of smooth nails.[3]

"**Length and Diameter of Nails.**—If the nail is short and is driven into soft wood, the weaving of the box in transportation and shocks due to rough handling will cause the nail to work back and forth to its full length in the wood and come loose almost immediately, notwithstanding the fact that it may be of comparatively heavy gauge.

"If the nail is very slender it will not drive well, and the longer it is the greater must be its diameter in order to insure that it will drive. If a very slender nail is driven to considerable depth in a piece of hard wood, the shocks of transportation and handling will bend the nail between the two planks of the box and it may fail by breaking off rather than by pulling out.

[3] NOTE—Mr. D. L. Quinn, late Director of the Forest Products Laboratory, explains nailing tests at that institution as follows:

"The holding power of cement coated, plain, and barbed nails was obtained by testing a standard 7-penny nail driven to a depth of 1 inch in dry wood and is given below."

Species of Wood Used in the Box	Longleaf	Basswood	Beech
	Load in pounds per nail		
Cement coated	250	133	430
Plain nails	140	82	400
Barbed nails	110	70	335

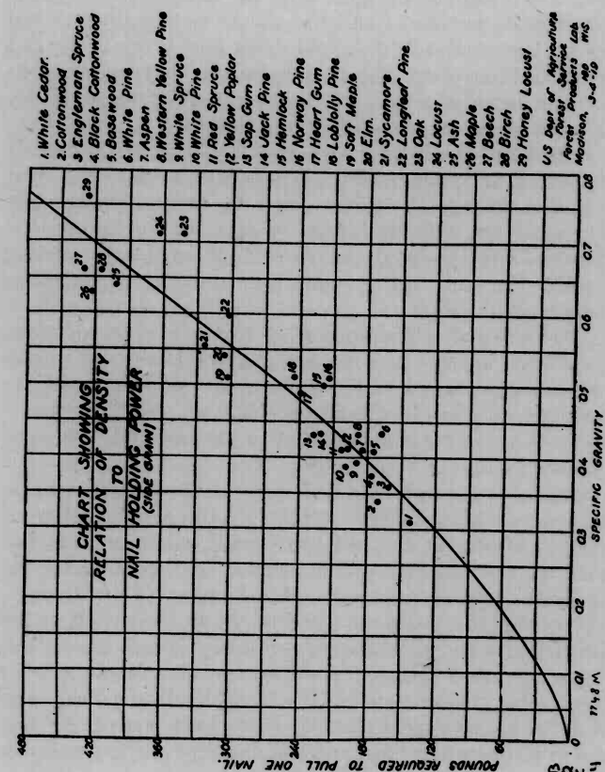


Figure 10.

"The diameter of a nail should be great enough so that it may be driven easily, which is usually the limiting factor, but should not be so small that it will break in use. It should be such that with the weaving of the package in transportation and the shocks of handling it will not be bent and will not work back and forth to its full depth in the wood. The proper balance is reached when there is an equal likelihood of the wood failing or of the nails breaking off or pulling from the end.

"**Head of the Nail.**—As a rule the head of the nail is too small, and failure of the box occurs because the head is pulled through the sides. With the larger heads made in accordance with the ordinary practice the material is too thin and the head breaks off. It is thought that a much better nail can be made than is being produced at the present time.

"**The Wood.**—The species of wood is of importance, since each species has certain characteristics of weight and hardness which indicate its ability to hold nails, its strength and its likelihood of splitting, and thus determine the proper thickness of material and size and spacing of nails.

"The most significant difference in the various species of wood is in their dry weight. A piece of lumber of very light weight has but little wood substance. It has been shown that all wood substance is of practically the same weight and that the weight of a piece of dry lumber, when free from resinous material, is an indication of the amount of wood substance it contains. It will be evident, therefore, that without sufficient wood substance it is impossible to have strength or nail-holding power, and that the more wood substance there is in a given species the greater its strength and nail-holding power are likely to be.

"Figure 10 is a curve in which has been plotted the density or dry weight of the various species against their ability to retain nails driven into side grain. In this connection it may be noted that, with practically all species, the resistance to withdrawal is greater if the nail is

driven into the side grain than if it is driven into the end grain. The curve shows conclusively that the heavier species hold nails much better. As a rule all the strength properties of wood increase with the weight. When a nail is driven into a dense piece of wood it produces a much greater splitting force than when the same nail is driven into a soft piece of wood. A dense piece of wood has greater resistance to splitting than a light piece of wood. These two factors tend to counterbalance each other but do not do so entirely. The dense species, as a rule, will split somewhat more than the lighter species with the same nailing.

"The lockiness of grain and other species characteristics are important factors in determining the resistance to splitting.

"**Condition of Wood.**—Green wood is much softer than dry wood, and the nails can be driven in and withdrawn from green much more readily than from dry wood.

"The moisture content of wood, when green, may vary from 30 to 200 per cent of the dry weight, depending on the species and on conditions of growth. As the wood dries it first loses the free water in the cells and afterwards that from the cell walls. When the water begins to leave the cell walls the wood begins to shrink in both width and thickness but not materially in length. This causes the fibers, which are bent down along the nail as illustrated in photograph fig. 9, to shrink away from the nail in the direction of the end grain, in which direction the nail was being most firmly held in the first place. Thus we have the nail which has been driven into green material, afterwards dried, held only by two sides. The weaving action during transportation will readily cause such nails to come loose and work out of the box without any rough handling, and the boxes will not stand more than 10 per cent as much rough handling as those nailed up at 15 per cent moisture and kept in practically that condition.

"A nail driven into a dry piece of wood which after-

wards is allowed to become soaked and then dried will act as does a nail driven into green lumber.

"Boxes made of lumber in the proper moisture condition will stand ordinary storage without any appreciable loss in the ability of the nail to hold.

"The effect of over-driving nails is to reduce their resistance to withdrawal, the proportionate reduction probably being greater in the case of dry wood than in green.

"**Thickness of Material and Spacing of Nails.**—After the above fundamentals as to nails and wood, consideration should be given to the thickness of material and the spacing of nails.

"The ends of the boxes must be of such thickness that the nails will not run out under ordinary conditions. The nails must be small enough in diameter so that they will not cause splitting of the material. The inclination to split is increased with decreased spacing. The spacing, then, must not be so close as to cause splitting.

"Experiments have been made and a great many observations taken on the splitting of material by nails. The following conclusions have been drawn and appear to be substantiated by two years of observation:

"In using the slender or box nail in species of medium hardness, the 'penny' of the nail cannot be greater than the thickness, in eighths of an inch, of the wood which holds the point of the nail.

"For the softer woods nails may be one 'penny' larger and sometimes even two 'pennies.' For the hard wood nails one 'penny' smaller should be used.

"The ordinary box machine, when nailing boxes of the sizes usually used for canned foods, cannot space the nails close enough to cause splitting of the ends or to develop the strength of the lumber.

"The following rule has been suggested for guidance in the spacing of nails for domestic[4] shipment:

"For six 'penny' or smaller nails held in the side grain there should be a spacing of 2 inches, and for the

[4] See Capt. Knowlton's chapter on Box Construction for his recommendations as to nailing export cases.

same nail in the end grain a spacing of 1¾ inches. For larger nails the spacing should increase ¼ inch for each 'penny.' To a great many people this spacing will appear to be too close, since it gives many more nails than have formerly been used. As a matter of fact, however, it is only about two-thirds of the number that can be put in before excessive splitting of the ends is encountered, and is only about two-thirds of the number required to balance fully the strength of the box in other respects. Therefore, even with this spacing, the nailing is still the weakest point of the ordinary box."

Special Box Corner Design to Prevent Loosening of Metal Straps

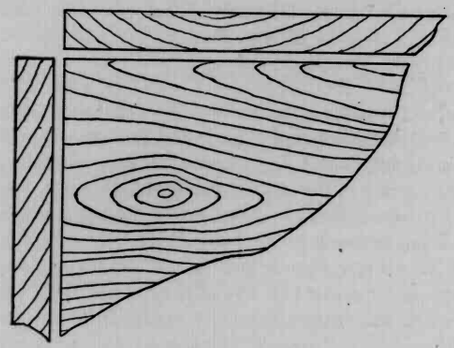
From Technical Notes of Forest Products Laboratory

Metal strapping applied to a box made of thin material cannot be fastened by nails driven into the edges of the boards, but must be joined by one of the various fastening devices and held in place by tension.

When first applied, the strap is very tight and no difficulty is experienced in keeping it on the box, but when the box is stored for a period of several months the shrinkage of the lumber usually reduces the circumference to such an extent that the strap falls off in transportation.

Such loosening of the straps may be successfully prevented on canned food boxes or, in fact, on any box carrying a commodity which has sufficient strength to resist the strap tension, by building the box in such a manner that neither the top nor the bottom laps the sides. The accompanying sketch will make the construction clear. The strap is applied in the usual manner and drawn very snug. The tension of the strap is sufficient to spring the sides, top and bottom of the box in against the contents so that the corner boards lap in the center. As a result, the middle of the box is smaller than the ends, and the straps will not slip off, even though the box shrinks. (See sketch page 160.)

Several such boxes were made up at the Forest Products Laboratory, Madison, Wisconsin, of lumber containing 15 to 20 per cent moisture and, after packing and strapping, these boxes were dried to a moisture content of 9 or 10 per cent, which is about the moisture content they would come to in a heated warehouse. It was found that, even after the boxes had shrunk, the straps could not be removed from them without cutting away the corners. When the boxes were tested in the revolving drum the straps showed a tendency to work toward the center rather than to slip over the ends.



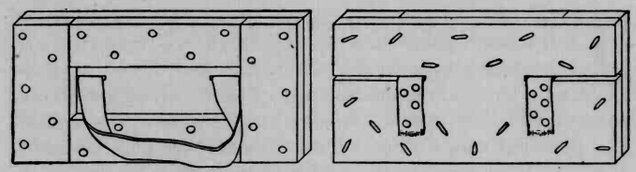
Courtesy of Forest Products Laboratory

Box Handles of Webbing Instead of Rope Save Shipping Space

From Technical Notes of Forest Products Laboratory

In export shipment, boxes loaded with 200 to 300 pounds are most easily manipulated when provided with handles. Usually such box handles are made of rope, inserted through holes in the ends of the box and secured with wall knots, or inserted in grooves on the under sides of the cleats on the ends of the box, and held in place by nails or screws driven through the cleats.

The former method of fastening has the disadvantage of taking up valuable space in the interior of the box. The latter increases the thickness of the cleats to provide for a groove of sufficient depth to hold the rope, thereby increasing the displacement of the box. Since the rates for export shipments are virtually based upon the cubical contents of the package, the displacement is an important factor.



Courtesy of Forest Products Laboratory

A box handle made of webbing instead of rope has been suggested by the Forest Products Laboratory as a means of conserving space. For this purpose webbing about ⅛ in. thick and 1⅛ in. wide, which has a breaking strength of 800 lbs., should prove suitable. It may be inserted through saw-cuts made parallel to the grain in the ends of the box, turned down flat inside, and nailed securely with large headed roofing nails.

Such a handle takes up no extra space either inside or outside of the box. It is easily made and has a lifting strength with a large margin of safety.

CHAPTER VI

BALING VERSUS CASING

By David T. Abercrombie [1]

THE men in charge of government packing during the war were face to face with the necessity of getting goods to the other side as quickly as possible, at a time when the amount of cargo space available was exceedingly small. It was our business to see that the problem was met and that the extreme handicaps of the situation were overcome, and with this end in view methods were adopted which were termed radical; under normal conditions they would probably not have been used or would have been adopted very gradually. The results proved, however, that in all cases the spur of necessity was highly productive, and there is no doubt that the experience obtained during the period of war effort is a splendid heritage for the department of overseas packing; similarly the experience in other branches of organized government war-effort will enjoy wide application in the industrial development of the future.

Before the war baling was a method used both in domestic and overseas packing for raw material and piece goods, but the extensive application adopted during the strenuous war-effort had not been made in commercial work. I had used various types of bales in my own business, but the larger use of these methods had, I believe, not been attempted and the problem of baling had certainly not been attacked with anything like the vigor or completeness that were made necessary by the exigencies of war. To illustrate this point, in my own

[1] Officer in charge Packing Division, Zone Supply Office, New York, 1918-1919. Chief, Packing Service Branch, Director of Storage, War Department, Washington, D. C., 1919. President, the Abercrombie Corporation, New York City, expert packing for export.

business we had developed a very good bale for clothing, but our experience was limited to only a few articles, while in the baling work for the army we had to care for a variety of commodities which superficially would seem to be unfitted for baling practice. When one day our department was presented with some 327 dozen saws and it was our business to pack them in a rush, obviously we had something quite new and an article which hardly seemed adapted to the work we were doing, and yet we baled those saws, saved costly space and made an excellent shipment. As time went on we baled many other commodities which would seem to be far removed from the possibilities of my department. There are certain things you cannot bale, such as will not stand compression, but whenever a group of commodities presented a new packing angle we could in the majority of cases decide to bale them with every probability of success.

In one plant our average production the first month was thirteen tons a day, and we thought this was very good work, but in the month of May, 1918, our daily output was 310 tons a day, and this average was maintained constantly until the armistice was signed. We were ready then with the new methods and machines we had inaugurated to increase our production to 600 tons daily, for the baling department had been called on to perform a far more comprehensive work than before. We were ready to pack the increase before deliveries began, and the armistice was the reason for cancellations instead of deliveries. The results obtained were very important, and the practice that ruled during the war is now being applied to normal industrial work, while the extension of this practice that was prevented by the termination of the war is being perfected.

I am perhaps giving the impression that baling as packing practice is as yet not widely in use, and if I am giving this impression it is correct but only in one sense. The technique of baling in the shipment of raw and piece goods both to points within the United States and overseas is used, and there is a beginning of baling some

manufactured goods, but I do not believe that the bale is as yet employed to anything like the extent that could be done if the advantages and savings of this method were fully appreciated and the force of habit could be broken. The savings are extremely important and goods properly baled are better packed than cased goods, and in every case baled goods will arrive at destination in far better shape than the same goods cased, while the economy effected by the use of the bale cannot be obtained by the use of any case yet devised, either as to cost of material or labor. To illustrate the points made here I am going to make use of my records obtained during the war; the work during this period was on such a vast scale and covered so many different commodities that no ordinary commercial records could give as much information.

Economy of Process.—After the signing of the armistice goods shipped to France began to come back to us in the original bales, and among this great mass I remember two bales containing 460 pairs of leggings which came back to us in just as good shape as they left the country. It happened that the balance of this shipment of leggings was packed in cases, and when these came back we found that many of the cases had been broken in shipment and a considerable portion of the contents lost and damaged. The two bales took up a little over six cubic feet and cost the Government $6.60 to return to the United States, while the cost of the same quantity of the same goods in cases was $30.80. This is a difference of more than five and one-quarter (5¼) cents on every pair of leggings for freight alone, an amount of money that would represent a big portion of the profit to any one handling the line. I could multiply this example by hundreds of a similar character, but this is sufficient to show immediately that where it is possible to bale goods no other method should be used.

Another great saving that is made by baling goods is in the tare, for baled goods will save 97 per cent in tare as compared with cased goods. When we entered the war we were packing in cases overcoats, blouses, underwear,

breeches—in fact everything that a soldier uses, and it was a regular thing (QMC Manual) to require 48 pounds of overcoats packed in 40 pounds of case. In 1917 and after it was very difficult to buy cases and we could not be particular about what sort of wood was used. In consequence vast quantities of yellow pine were bought and made up into cases, and these cases often weighed more than 90 pounds, and this 90 pounds of case had to be shipped not alone to Europe but all over the United States, enriching the express companies, it is true, but costing the Government large sums of money. We paid as high as $14 per hundred pounds when we had to send goods to the far west, and it does not take much effort to figure the immense loss when 48 pounds of goods had to go in 90 pounds of case, and when on every pound 14 cents or more had to be paid for transportation and in addition an excessive price had to be paid for cases. If we had used then as we did in January, 1918, bale packing we would have saved 45 per cent in transportation, 70 per cent in space and 82 per cent in the cost of packing materials for the war. Our saving throughout the whole period, calculating a list of 141 articles packed in standard 4 cubic ft. bales and also in standard (previous to January, 1918) 6 1/5 cubic ft. cases is shown by the following ratios:

This comparison is based on an equal quantity of goods in each one of the ratios.

Number of packages	1 (Bale)	to	2.1	(Cases)
Cubic ft. of space	1 (Bale)	to	3.94	(Cases)
Cost of container	1 (Bale)	to	5.50	(Cases)
Packers' cost (labor)	1 (Bale)	to	2.50	(Cases)

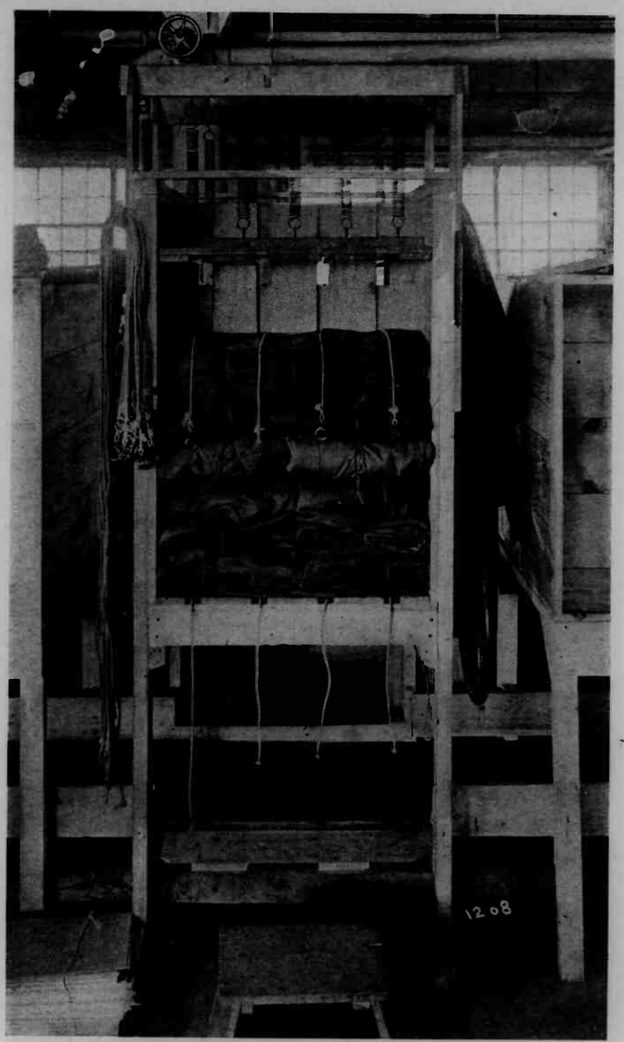
Up to November, 1918, the amount baled in the New York District was a little over 137,000 ship tons, and although no one knows exactly what it cost to send over a ship ton, there was an arbitrary cost adopted in Washington of $240.00. However, I know of a good many instances where the cost was nearer $340.00 a ship ton, and there was an instance of a shipment where the cost ran as high as $22.50 a cubic foot. I believe that when

the bill is finally settled and all the costs of convoys, losses and other incidental expenses are figured out that $10 a cubic foot would represent a fraction of the real cost. The fact that $6 a cubic foot or $240.00 a ton, is the price that has been fixed probably will not affect the result so far as the individual citizen is concerned, for the money has been spent and we have got to pay it.

But what does interest the individual citizen is that this great cost was not altogether unproductive, for out of this immense transportation task certain absolute facts were developed which will mean great savings to the people in the future. To put the situation in a different form it may be safely stated, that the saving to the Quartermaster Corps resulting from the use of bales instead of cases was over $100,000,000. Had the war continued we should have been able to bring about still greater saving, and had we been prepared to use bales at the start we would have cut out big slices in the nation's bill of expenses.

With reference to warehousing, the use of bales shows important savings in rent, for baled goods not only occupy less space than cased goods, but they can be stowed much more compactly. I believe it is safe to say that fully 70 per cent in space is saved by baling. There is great saving in dunnage, and another important saving arises from the relatively small space occupied by a baling plant as compared with that absorbed by a casing plant. In the latter the wood of which the cases are made is itself bulky, and the manufactured cases occupy a great deal of valuable floor space, which in these times of inadequate storage space and high rents is a consideration of great importance. The baling plant, on the other hand, occupies less than one-sixth of the space taken up by the casing plant, the material of which the bales are made can be most compactly stored, and there is no space taken up by an intermediate product represented in the casing plant by the unfilled box.

We have thus clearly demonstrated important savings in the chief factors of shipping expenses: we have saving



USE OF FORMING MACHINE.
Garments bricked in forming machine for construction of preliminary bale.

INTENTIONAL SECOND EXPOSURE

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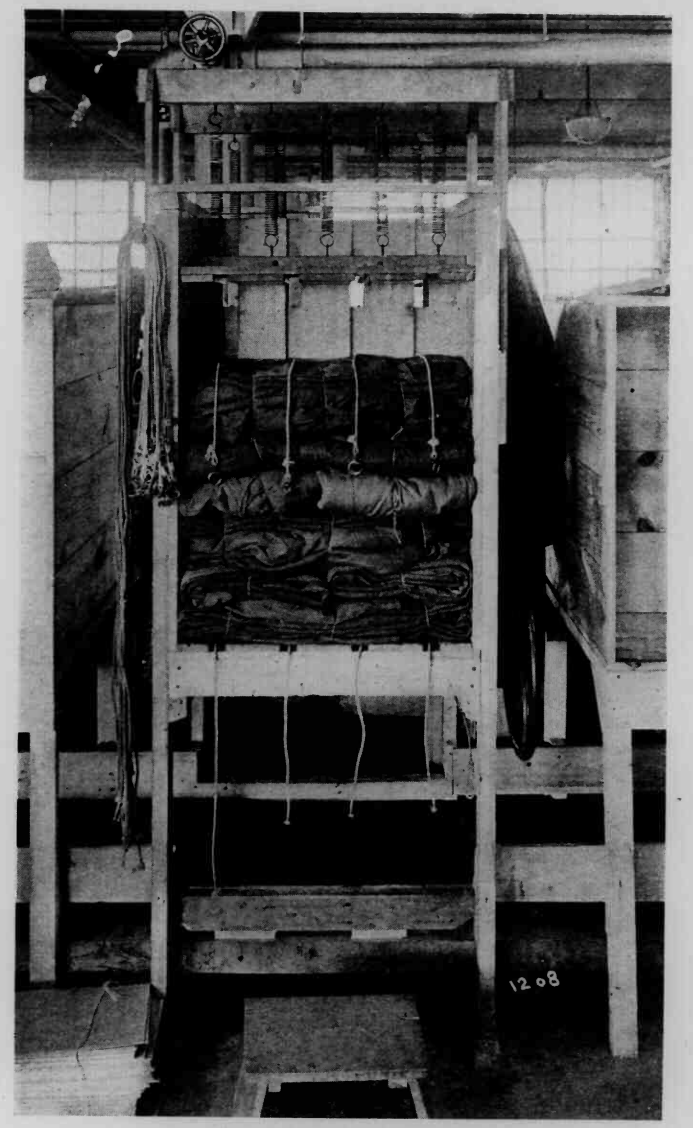

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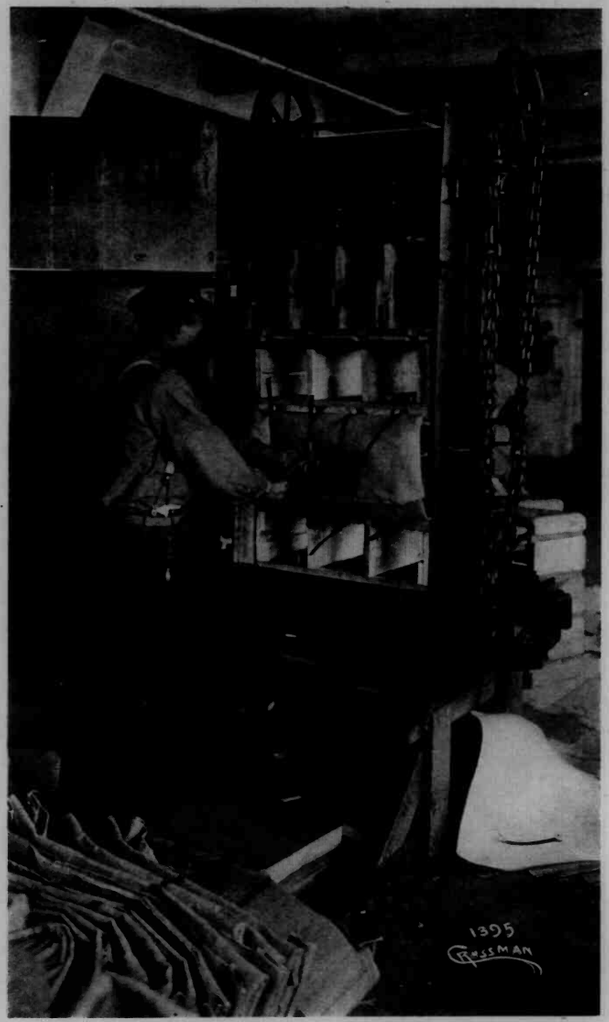

OPERATING A HAND PRESS.

in space and consequent saving in the cost of any form of transportation; we have saving in tare, which is of the utmost importance in shipments going to foreign countries or anywhere; we have saving in the cost of the package, which to-day is an element of the utmost importance, and we have saving in the space occupied by the shipping department, another very important item in the total cost. And to these economies must be added the equally important one that the bale will travel where the case hardly can, that the goods are abundantly and fully protected, that the range of adaptability of the bale runs from socks to overcoats, from water bags to cooks' caps, from nose bags to tents. Another great saving is that of natural conservation; in our baling a bale used 2¾ yards of burlap; the same amount of goods require 60 feet B.M. of lumber when cased. Burlap grows two crops a year; lumber takes 30 years to grow; acreage is as 1 to 60.

Possibilities of Commercial Use.—It seems to me that I must emphasize here the effect that this war work has had on civilian trade, for as I understand it the purpose of this treatise on packing is not to show anything new to the man who has solved his packing problems through long years of grief and struggle, but to tell the newcomer something of what can be done and should be done in packing overseas goods. Up to the time we started our work of compressing fabricated goods I knew of no concern that made a practice of compressing fully made-up clothing. As I have stated, I had done this work in a small way in my own business, but when I called the attention of the authorities to the possibilities of the method I was told flatly and simply that it could not be done. I was told it would break the buttons, that the goods could never be freed from the creasing incident to baling processes, that it was a fool idea and a great many other things equally theoretical which were proved in actual practice to be incorrect.

When a man walks on a carpet, say he weighs 200 pounds, the actual pressure is fully 1,200 pounds to the square inch maximum, as one-sixth of a square inch is

INTENTIONAL SECOND EXPOSURE

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When a man walks on a carpet, say he weighs 200 pounds, the actual pressure is fully 1,200 pounds to the square inch maximum, as one-sixth of a square inch is

about as much as is in contact as his foot first falls. It is a fact known to all of us that hotels and other buildings where foot traffic is heavy almost invariably use a heavy pile fabric for carpets, as it has been proved that this class of floor covering lasts longer and costs less per diem than any other suitable material. Returning to the buttons, I folded up some overcoats (September, 1917) and sent them to a laboratory at my own expense, as I had not learned then how to get the Government to pay for such things, and I found that we could put on a pressure of many tons before the button collapsed, and then the metal buttons or shanks did not cut the fabric. It was a simple natter to calculate then that if we kept a certain maximum we could use any pressure under this in making up our bales of clothing. I already knew that 92 pounds is a weight that one man can handle most economically, and we accepted that as the standard weight for a package. Then I investigated the specific gravity of clothing and equipage and we calculated that this would average less than four cubic feet for 92 pounds.

The best package therefore we decided would measure (average) four cubic feet; it should be twice as long as broad and a little less in height than in width, weigh 92 pounds and would, to be exact, be 15 x 30 x 14 inches. The covering was 10 oz. burlap for outside, with two sheets of expansive (both ways) paraffined baling paper for interlining; on rare occasions we doubled the covering. This package is the correct size for handling during the baling process; it fitted the French cars and American escort wagons and automobile trucks, and could be handled by one person of any nationality, and we put more clothing in a freight car than had ever been accommodated before, loading many of the articles to the capacity of the car. And this result was obtained in a short time in spite of the fact that when we started we did not have any machines nor was there a machine made that was adapted for the work. Day after day we packed millions of articles in our New York plant, 16,000 pairs of socks in every ton, 300 overcoats to the ton and so on

through all the list of things that fighting men need when they are in the field. Over the river at Bush Terminal No. 22, where the first plant was established, the bale was shown to be a method in overseas packing that could accomplish astonishing things, and that could effect economies of time and money that were absolutely out of the question by any other method. When we were packing 340 tons a day the complete organization numbered some 2,230 persons, and this number included the receivers, routers, inspectors, warehousemen and shippers.

Organization of a Department.—Careful routing of the goods is very important in any well-organized plant, and the plant should not be put in operation until experiment has shown that the routing is correct. The operations in baling are very closely related, and the more the work tables can be grouped and the closer together all working elements can be arranged just that much will be gained in efficiency and speed. There were certain details in our work, such as receiving and inspecting and checking, that will not enter into the average commercial equipment and will not be a part of the baling department, but with us the checking and receiving were intimately related to the baling department, so that once installed the system worked automatically. But throughout the whole process every movement was related to the ultimate purpose: the shipment of a bale. A bale was completed 40 minutes after receiving the goods.

Another important consideration is the fixing of responsibility for mistakes in packing, and this can be done perfectly with our method. Each bale carried a numbered tag signed by every one who worked on that bale. In each of our packages that made up a bale there was enclosed a slip, and all persons having to do with the work on that particular package signed their names, no matter what the character of the work, inspecting or folding. When the goods reached the other side, if there was a defect, all that was necessary was to return the slip with the statement of complaint, and the matter could be absolutely traced to the inspector or folder at fault.

When the bale was shipped the tag was cut from the bale and retained, leaving the number on the bale. Thus a record was kept.

How to Bale.—In folding goods for baling each article is folded in its own way and made into a package of a certain number. The idea here is to obtain the same number of laminations in each package of goods entering the bale, and this similarity in folding must obtain whether goods be mosquito bars or trousers. With this identity of folding in each separate piece of goods it is also easy to obtain perfect compactness and uniformity in width and length, which are so necessary to any successful baling operation; then the correct number of packages are laid to make up a bale, and when pressure is applied you get a minimum size bale for the amount of goods it contains.

In practice we found that the results described in the above paragraph were little short of remarkable when compared with former results. Under the system of packing first used only 50 blankets were cased into a ship ton, but with our baling system we put 256 into the same space. We put 962 mosquito bars where formerly only 116 had been placed, and the whole secret of this result was in so folding the goods that absolute uniformity in the size of package was obtained. We had a standard size for our bales and this size was used no matter what the goods: blankets, gloves, breeches, blouses, overcoats, caps, hospital tents, and so forth.

Another important point is the density of the bale, for unless the proper density is obtained much of the virtue is taken out of the work. Cotton has been baled for a good many years in the south and one would suppose that the wide experience incident to that work had solved the question of proper density. But we packed some of our garments in bales that had nearly twice the density of a bale of cotton, although our goods were not a raw fiber that admits of almost any compression, but manufactured goods, many of which had parts more or less susceptible to damage.

STANDARD AND COMMERCIAL BALES.

Former measures 4 cu. ft. and contains 14 comfortables; latter measures 20 cu. ft. and contains 12.

STANDARD BALE AND CASE.

Bale measures 4 cu. ft. and contains twice as many units as case measuring 6 cu. ft.

EXAMPLE OF POOR PACKING.

The U. S. Army packing service found that bales in many instances withstood rough handling better than cases.

INTENTIONAL SECOND EXPOSURE

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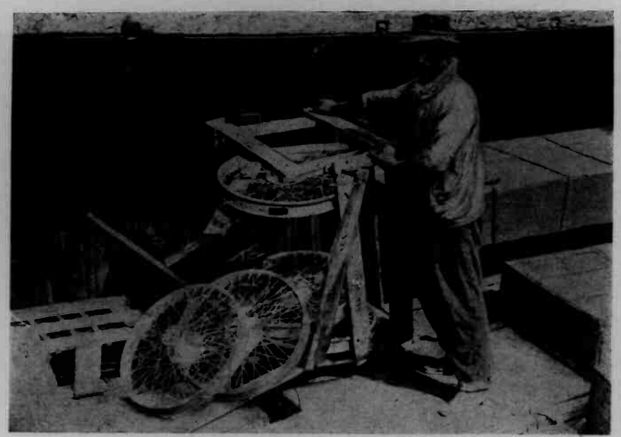
ON THE BRIDGE AT GALATEA.
Shows method of transporting furniture in Turkey.



Courtesy of The Americas.

EXAMPLE OF POOR CRATING.
Crate containing automobile wheels which was broken when it arrived at its destination.

Twenty-four tons pressure on a surface of 450 square inches harmed nothing. Our officers' uniforms carried splendidly, so did our fur caps, fur gloves and fur Paakas to Siberia. Fur caps, the most expensive things we shipped, $3,000 worth in a bale, arrived safely at destination and not a single complaint was made on account of loss or stealing.

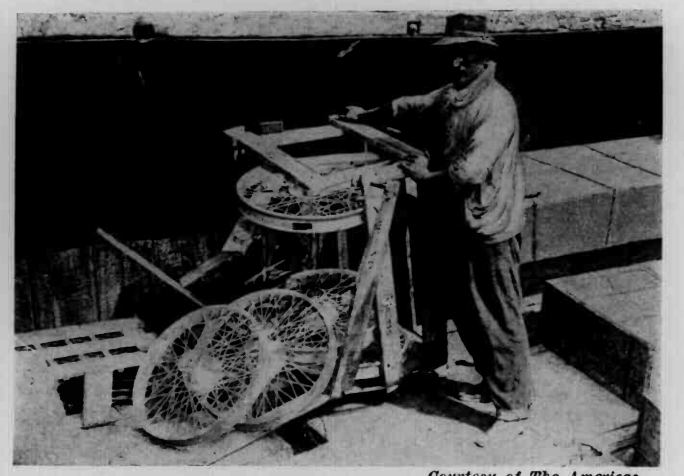
In making up the bale the packages were placed one on top of the other in layers like masonry. The bales were protected with waterproof expansive paper covering besides the regular burlap covering. Many of these bales crossed the water, suffered exposure that rusted the metal bands almost completely through, and yet came back to the United States with the goods inside just as smooth and perfect as the day they left our shores, showing beyond question that burlap and paper make as sturdy a protective envelope as any case that was ever devised. Cased goods returned were a mess. The stealing from the bales was practically nil, for in this class of packing it is very difficult for a package or piece to be removed; to do so a steel band must be cut, and that would not escape detection. It is true that we lost an occasional bale as well as case, but tampering with the bale itself and removal of contents was practically unknown. Our records show that there was one complaint of mismarking to 30,000 bales. This, I think, is a very good record indeed.

Another interesting point about the bale was the salvage value of the material used in covering. When wooden cases got to France and were opened at the front they could not be burned because of the smoke, and they could not be well used for other purposes. The covering of the bale, on the contrary, came in splendidly for many uses, particularly for sandbags, each piece of burlap having been cut to make two sandbags.

Marking.—Our bales were marked with numbers, each number designating a particular commodity, and the same method could be profitably used in a great deal of export work. It does not matter what language a man

INTENTIONAL SECOND EXPOSURE

ON THE BRIDGE AT GALATEA.
Shows method of transporting furniture in Turkey.



Courtesy of The Americas.

EXAMPLE OF POOR CRATING.
Crate containing automobile wheels which was broken when it arrived at its destination.

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speaks, he may be Chinese, African or Portuguese, but this notwithstanding he will learn immediately the significance of a number, while printed or painted words would be unintelligible. And so we used a four-inch black number on a buff background that could be distinguished a long way off. We had a series of basic numbers and another of subsidiary numbers. For example, "15" stood for overcoats, as that was the quantity put into a bale, and when the "15" had a number "40" by the side of it, separated by a dash, this was a bale of overcoats size 40, the left-hand number denoting the quantity in the bale, i. e., 15. This was done throughout. There were different sorts of gauntlets: heavy leather, lined, chauffeur, and so on. Each had its basic number and another number alongside to designate the particular size of glove. In a short time we found that the men became acquainted with the numbers and rarely made a mistake. This helped greatly in warehousing. We found the question of hooks was solved by having ears on the bales for handles, and the moderate weight rendered hooks unnecessary.

Doubtless there are questions that I have not answered and that will occur to every reader, but the space at my disposal does not permit a lengthier discussion of the subject of baling. The point I have tried to make here is that of the value of baling as a shipping and packing method, and I believe that what I have said will be sufficient to cause investigation on the part of the individual shipper. If this is done the correctness of my statements and conclusions will be fully demonstrated.

It should be appreciated that I have attempted here to show clearly the tremendous possibilities in the baling of goods, and in our practice with overseas shipments during the war we found that there were very few commodities that could not be satisfactorily baled. However, I do not wish any shipper to assume that the practice illustrated is suitable in all commercial transactions. In the case of shoes, hardware and other goods, bulk shipments in bales should be made only after an understanding has been reached with the consignee that such form of packing would be satisfactory. It is quite possible that consignees would desire shoes, hardware, ready-made clothing and other commodities packed in certain form and in cases rather than in bales, and the shipper must be thoroughly sure of the wishes of the consignee before proceeding to make up the package. The point that I have desired to stress in this article is that the bale offers a most economical and useful means of packing and shipping goods, and that the possibilities of this method should be always considered in any packing problem.

CHAPTER VII

THE FOREST PRODUCTS LABORATORY AT MADISON, WISCONSIN

TEN years ago the Forest Service of the U. S. Department of Agriculture established the Forest Products Laboratory on the Campus of the University of Wisconsin, at Madison, Wisconsin, and the record of the laboratory during the period of its existence has been one of incalculable usefulness to the Government and to the nation at large. At first the laboratory occupied one small building and had a meagre annual appropriation for its support, but so important a place has it taken in the work to which it is devoted and so extensive has its cooperation become with the Government and business interests of the country, that to-day it occupies several large buildings, its personnel numbers over two hundred people and it is receiving nearly a half million dollars a year for its support. It is without doubt one of the world's greatest industrial laboratories, and so thoroughly has it proved its usefulness that a number of large organizations are now constructing laboratories of their own, modeled after the one at Madison. So far as we know, Canada is the only foreign country that possesses a similar institution, and this was planned along the lines laid down at the plant in the United States.

Its Service to Export Manufacturers and Shippers.—In one of its bulletins the Forest Products Laboratory states that "no industrial research is complete until its results have received commercial demonstration and the industry concerned is reaping the benefits. It is essential, therefore, that proper contact be maintained between the industrial research laboratory and the industries which it serves." This we believe expresses in a few words the

spirit and purpose of this most interesting and helpful organization, and also illustrates the practical cooperation that is given the business world. The services of the laboratory are available to the export manufacturer and shipper, and the expert knowledge of its staff is brought to bear on the special problems, either at no cost or for a nominal fee, depending upon the nature of the case.

The officials of the laboratory urge that information be solicited and every effort will be made to give as full and complete an answer to the inquiry as possible. The results of the laboratory's work are published in the form of bulletins issued by the Department of Agriculture, in the form of articles in the trade press, and there is a service of mimeographed reports which are available upon request.

When special cooperative work is undertaken by the laboratory there is a charge for the service, the remuneration, however, being reduced to the extent to which the work is purely experimental and of value chiefly to the laboratory.

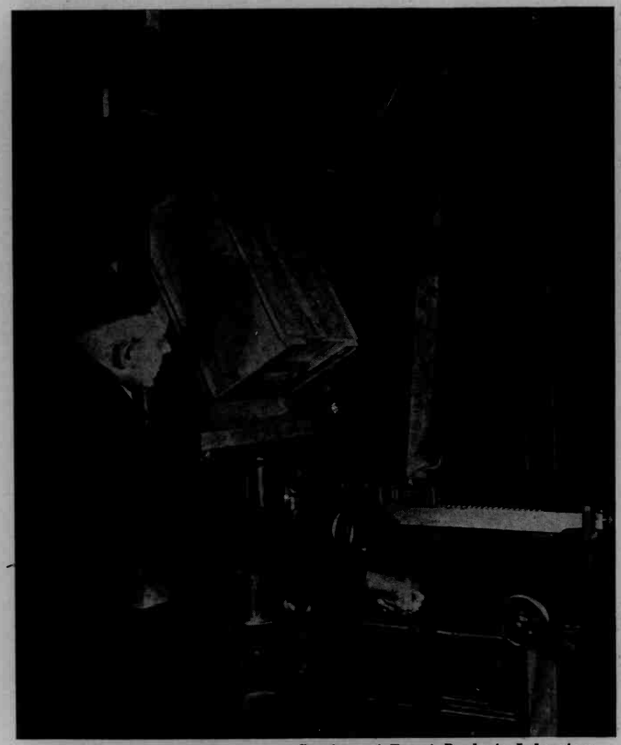
The laboratory is always open to visitors, and those whose interest is merely general are shown through the various departments and the work carefully explained. Those who come to the laboratory for the purpose of obtaining specific technical data or to obtain help in the solution of some specific problem, are directed to the proper office and every effort is made to render the service required. Reports state that it is not uncommon for visitors to spend a week or more at the laboratory, studying data and consulting with different members of the staff, and from time to time special one or two-week courses are given on subjects within the province of the work, for example, on kiln drying, box design, manufacture and use of plywood, glues, and so forth.

As time and funds permit the members of the staff make special trips, problems are studied at first hand in private plants, and demonstrations are made in factories of new processes which develop from the research work of the laboratory. Likewise the meetings of associations

are attended by members of the staff and lectures are given, frequently illustrated, on special subjects.

Examples of Its Work.—In 1917 the Forest Products Laboratory was designated by the Ordnance Department for the solution of container problems, and there can be no doubt that the war was shortened measurably by the fact that the laboratory designed containers that made possible larger and quicker shipments to the soldiers in France. In redesigning a case fitted to carry 140 pounds of powder 14 per cent of cargo space was saved; a Government school for packers was established at the laboratory, and one of the men designed a box that saved the Government $100,000 in freight in six months; another case for packing soap was re-designed with a saving of 43 per cent, and on the first shipment the Government saved $414,000; a case for carrying two Browning guns was re-designed with a saving of 28 per cent, and this meant a saving of $5.77 on every two guns shipped, and for many months the shipments were 900 guns a day; a box designed for the regular army rifle saved one-third of the former space, which meant $1,500,000 on every shipment of a million rifles; the losses suffered by the Government from poor packing were reduced by the Forest Products Laboratory to 15 per cent of what they had been before packages perfected in the laboratory were used.

Other Branches of Its Work.—The activities of the laboratory, however, are not restricted simply to the solution of packing problems, although this is the work that chiefly concerns the scope of this book. The laboratory also devotes itself to any problems related to lumbering, physics of timber, mechanics of timber, wood preservation, derivative products of wood, wood pathology and pulp and paper. In this last commodity the laboratory has a most interesting field and one that affects the public intimately, in view of the decreasing supply of pulp timber and the constantly increasing scarcity and rapidly mounting cost of paper. There is no doubt that sooner or later a way will be found for utiliz-



Courtesy of Forest Products Laboratory.

MAKING A "COMPRESSION ON THE EDGE" TEST.

This test consists in standing a box on its edge and applying a gradually increasing pressure.

INTENTIONAL SECOND EXPOSURE

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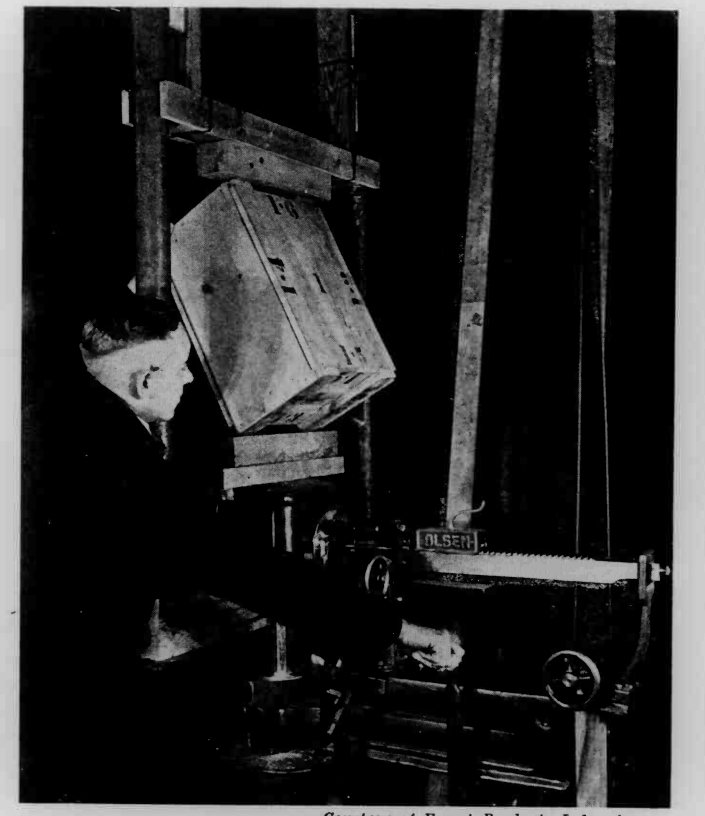

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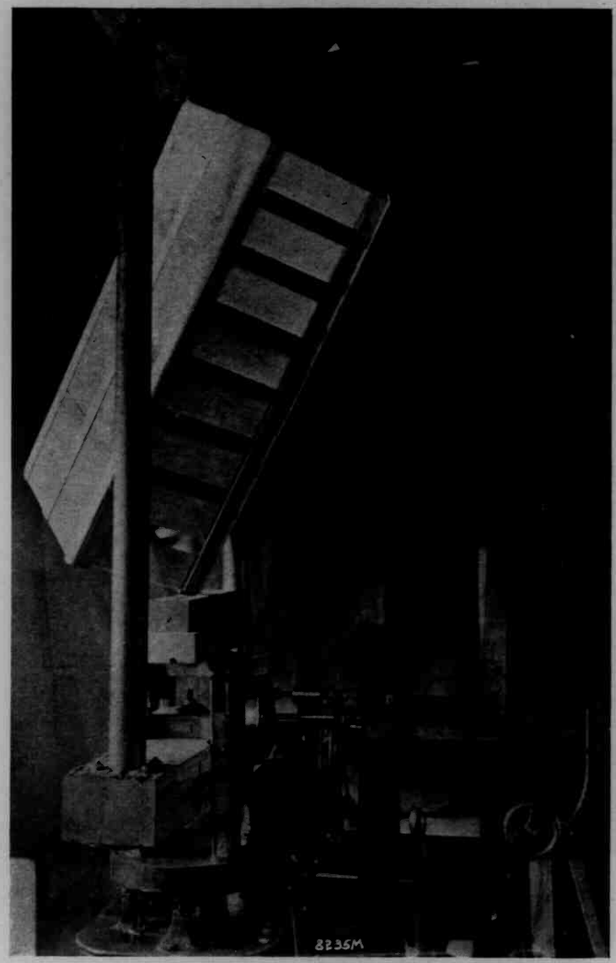


Courtesy of Forest Products Laboratory.

MAKING A "CORNERWISE COMPRESSION TEST."

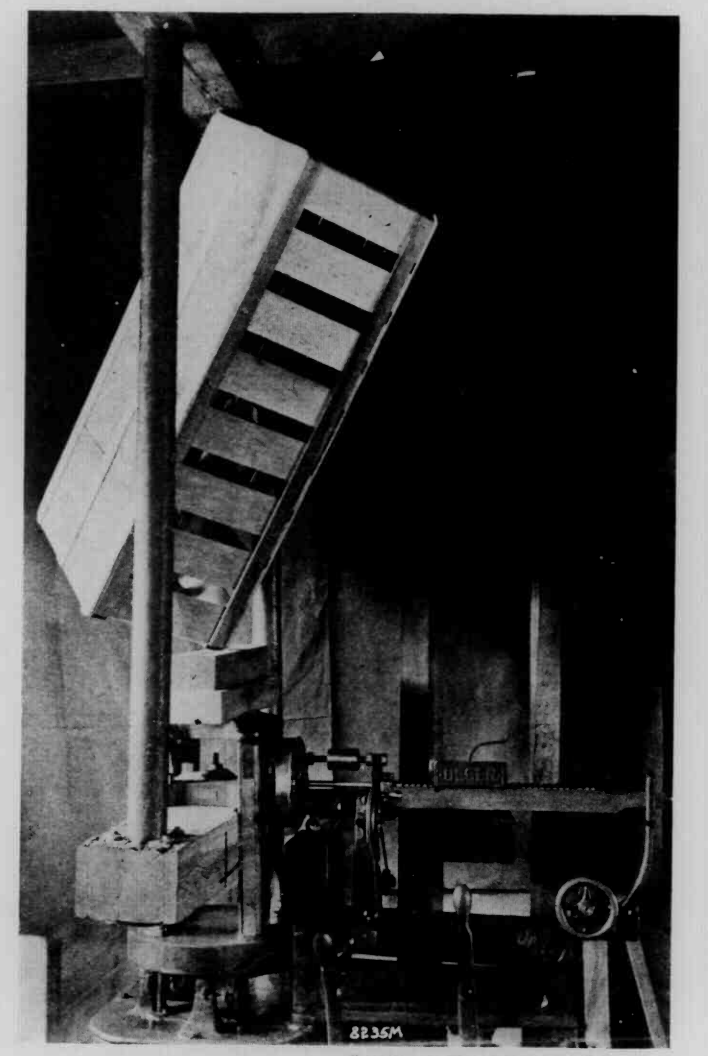
This test consists in a steady and constantly increasing pressure measured in pounds, applied to the corner of any package with the opposite corner in a direct line with the pressure.

ing more of the tree in the manufacture of pulp, for in the language of the laboratory, "a ton of dry wood yields only nine hundred pounds of dry sulphite pulp for paper. The rest is lost in the waste sulphite liquor."

Solving Business Problems.—And so thousands of problems have been submitted to the laboratory by the Government and private interests, and thousands of these problems have been solved. In its manifold Government work the laboratory not alone found out the most suitable woods for airplane propellers during the late war, but also invented a method for perfectly drying the wood in from ten to twenty days, something that before that time had taken from one to two years. The laboratory also discovered the method of waterproofing the propeller, known as the aluminum leaf method, and the experiments on plywood, or veneered wood, carried on at the laboratory, saved the Government some $6,000,000 in wood costs and prevented countless airplane accidents. The inventions of the laboratory in glues alone would fully justify its existence if it did not have to its record a great number of achievements in many other departments, and let us repeat that just as the laboratory solved Governmental problems, it stands ready to solve the problems of business, whether these problems have to do with the preparation of shipping cases or crates or with some other work entrusted to the vigilance of this most important efficiency organization. Many business concerns have made use of the facilities offered, and the General Electric Company has smashed thousands of electric lamps in testing machines of the laboratory for the purpose of designing a suitable container.

Method of Testing Containers—We show herewith a number of illustrations, among them being the so-called "hazard" machine, which is designed to give a box or case as many bumps and jars as it would receive on an ordinary thousand-mile journey. It is interesting to note that these machines are now being built for private plants, the Edison Lamp Works of Harrison, N. J., having just installed such a machine at a cost

INTENTIONAL SECOND EXPOSURE



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of $2,500. This machine is hexagonal in shape and revolves vertically, the inside of the drum containing ridges of wood and metal. Each time the wheel revolves the box being tested drops six times, a meter keeping accurate count of the drops, and the drum revolves so slowly that as the cracks open or the wood splits it is easy to follow the process. These tests show the defects of the particular container and new designs are then placed in the drum which are put through the same test, and so the story goes.

Another test that we illustrate is the "Cornerwise Compression Test," which consists of standing a box on a corner and applying a gradually increasing pressure or squeeze. Another test is the "Compression-on-an-edge Test," which is the same method as that used in the first test, only in this case the edge of the box is submitted to the experiment. Of course all of these tests are carefully recorded and the data minutely examined. Still another test is the "Drop Test," in which a case is repeatedly dropped and the results carefully watched.

We have given a very summary view of what the laboratory has done and is doing, but it is not possible for all of us to go to Madison nor can we take a personal part in the experiments. However, the laboratory has anticipated all of this and comes to us in the form of exhaustive tabulations of the results of experiments, and practical data obtained from them. One of the most interesting is a report of the laboratory on "Balanced Packing Box Construction." This we print in full as follows:

"A properly designed packing box is one which has enough strength in each part for the purpose for which it is intended, and no more strength in any part than is necessary to balance the average strength in every other part. The data necessary for designing such a box cannot be obtained from observation of boxes in actual commercial service, because the observer sees the box only after it has completely failed. He does not see the beginning of the failures; and he does not see and consequently cannot measure the hazard which completes them.

A failure frequently bears evidence in itself of the cause of the damage; but there is no way of determining from a study of the failure the amount of force exerted by the damaging cause, and in cases where several causes have been active it is impossible to identify each of them. On the other hand, laboratory studies (made at the Forest Products Laboratory, conducted by the Forest Service at Madison, Wis., in cooperation with the University of Wisconsin) combine practical experience, which is a knowledge of the designs in use, of what lumber is available, and of box factory practice, with accurate scientific tests made on the package itself, packed as in actual service and subjected to strains that appoximate actual transportation conditions.

Tests to Determine Box Design.—"Compression-along-an-edge test, as its name implies, is a steady and constantly increasing pressure (measured in pounds) applied along any edge and with the opposite edge diagonally through the box in a direct line with the pressure exerted. The corner-wise test is applied in the same way to any corner of the package with the opposite corner in a direct line with the pressure. These two tests measure the strength of the box in withstanding any external pressure, and to a limited extent approximate the hazard of the lower tiers of boxes in a pile. By themselves these tests are insufficient to determine comparative weaknesses in the various factors that enter into properly balanced construction.

"Another very good test is the drop test, especially for comparing the strength of one box with that of another. In this test the box is packed with the actual contents as in service and dropped from a predetermined height directly on the corner, which is a fall that occurs in actual service. The value of the conclusions, in any constructive way, is limited, however, because one failure runs so rapidly into another that the observer does not always get the true measure of the weakness.

"The most practical method yet devised for testing packing boxes is the revolving drum test. The drum is a

hexagon-sided machine and revolves slowly. The box to be tested is packed with the actual contents, as in commercial service, and placed in this drum. In the drum are arranged a series of hazards, which cause the box to follow a regular cycle of drops, falling upon sides, top, bottom, ends, edges, corners, and flatwise upon a projection similar to the corner of another box. These drops simulate the usual hazards of transportation, excepting the heavy static pressure received by a box in the lower tiers of a pile, which is secured by means of the compression-on-edge test described above.

"As the box moves on from one drop to the next the observer notes the beginning of the failure of the weakest point in its construction, and follows the development of that weakness until the box entirely fails and lets its contents out.

"The weak feature of the box may be too few nails, nails of too short a length, nails driven in a crack and thus having no great holding power, or some other form of nail failure; and the tests clearly show this weakness. The material in the sides, top or bottom may be too thin, so that the shocks of the falls pull the wood from the nails. The wood may split or break across the grain.

"Any one of the numerous weaknesses of packing-box construction may be developed in this test, until finally the observer is able to build up a box that is practically equally strong in every feature. Boxes are then built, packed, and tested until the presence of this balance in design is clearly demonstrated. Such a demonstration will show failures ultimately occurring in average proportion in nails pulling from the wood, wood pulling from the nails, splitting or breaking of ends, sides, tops or bottoms, and through the weaknesses of the species themselves.

Conditions Which Affect Box Design.—"Commercial conditions and practices in box factories enter into consideration in designing containers of proper construction. Packing boxes are made of low-grade lumber. This lumber is low grade because of splits, shakes, knots,

Courtesy of Forest Products Laboratory.

INTERIOR OF LARGE TESTING DRUM.

Used in revolving drum, or hazard, test on boxes up to 48", and 1000 lbs. in weight. Can be made to test boxes and crates up to 6', and 1500 lbs. in weight.

Courtesy of Forest Products Laboratory.

PREPARING FOR A DROP TEST.

The box is packed with actual contents and dropped from a predetermined height directly on the corner.

INTENTIONAL SECOND EXPOSURE

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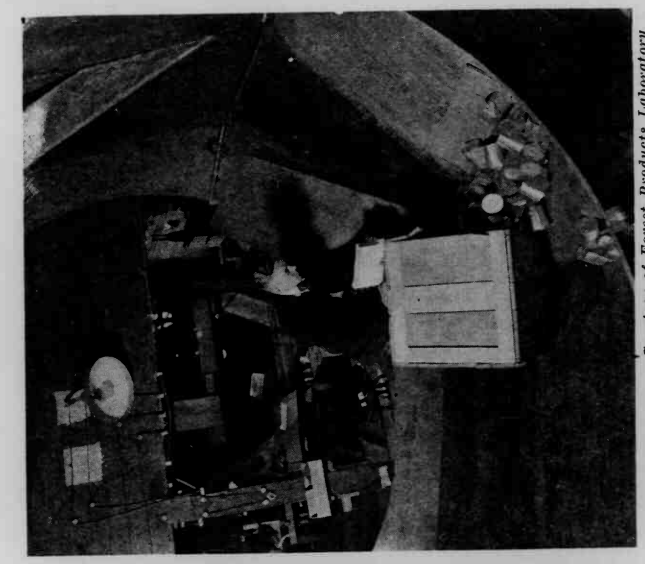

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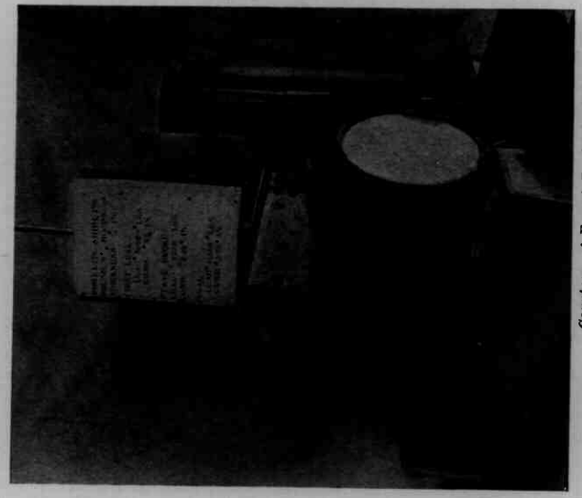
DIAGONAL-COMPRESSION TEST FOR BARRELS.

Barrel is compressed between two flat surfaces, supported on one edge or chime and loaded on the other.



Courtesy of Forest Products Laboratory.

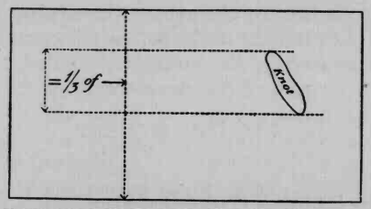
SIDE-COMPRESSION TEST FOR BARRELS.

The barrel is placed between two flat surfaces and compressed in the direction of its diameter.

knot holes, dote, or other defects. Such defects as affect the proper efficiency of the box must be cut out; but those defects which do not destroy the proper balance of the construction should be permitted, so as to keep down the cost of manufacture.

"As lumber is sawn into such thicknesses as bring the best market prices for the high grades, the low grades must be necessarily of the same thicknesses. The thicknesses specified in the packing box must be obtainable from this lumber without undue waste.

"Certain box factory equipment is standard. This should be kept in mind and no construction adopted that requires special equipment unless some essential features of construction cannot be obtained otherwise.



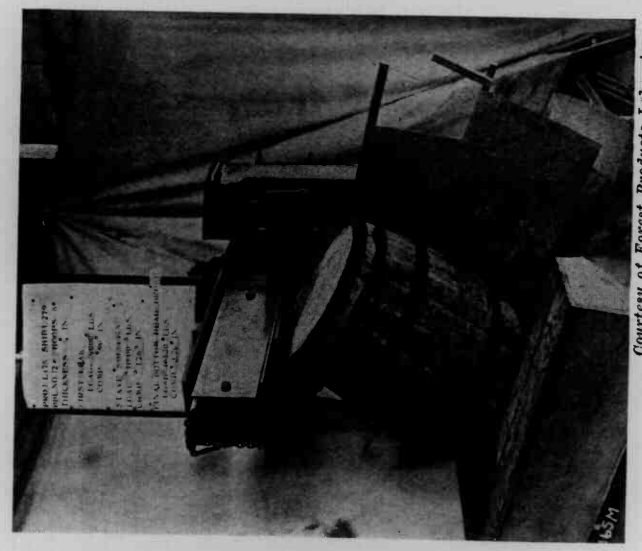
Courtesy of Forest Products Laboratory

Figure 1. Method of measuring size of knot.

Aids in Box Designing.—"As a result of many box tests of all kinds certain aids of somewhat general application in designing packing boxes may be suggested. No general rules can be laid down, however, for the reason that each box must be built with reference not only to the external shocks it will have to endure but also to the nature of the article it is to contain. Some commodities require partitions, trays, diaphragms, and the like. Some commodities are affected by heat or cold. Some commodities contribute strength to the package; others are fragile, so that all the required strength must be in the box itself.

"A design which takes into consideration these points

INTENTIONAL SECOND EXPOSURE



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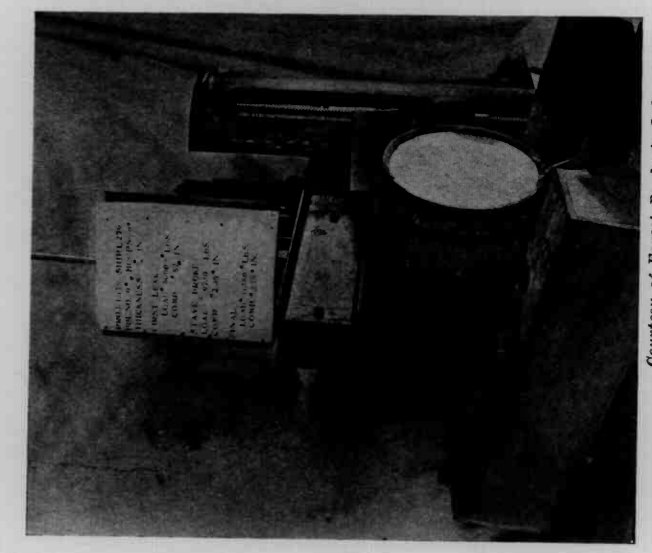

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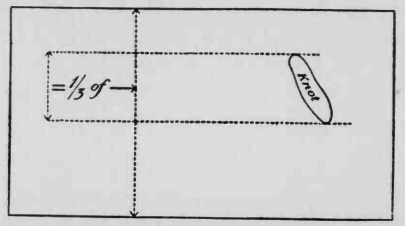
"As lumber is sawn into such thicknesses as bring the best market prices for the high grades, the low grades must be necessarily of the same thicknesses. The thicknesses specified in the packing box must be obtainable from this lumber without undue waste.

"Certain box factory equipment is standard. This should be kept in mind and no construction adopted that requires special equipment unless some essential features of construction cannot be obtained otherwise.



Courtesy of Forest Products Laboratory

Figure 1. Method of measuring size of knot.

Aids in Box Designing.—"As a result of many box tests of all kinds certain aids of somewhat general application in designing packing boxes may be suggested. No general rules can be laid down, however, for the reason that each box must be built with reference not only to the external shocks it will have to endure but also to the nature of the article it is to contain. Some commodities require partitions, trays, diaphragms, and the like. Some commodities are affected by heat or cold. Some commodities contribute strength to the package; others are fragile, so that all the required strength must be in the box itself.

"A design which takes into consideration these points

and the conditions in the industry as well will result in well-balanced construction, and the most practical and economical package for the purpose intended; but laboratory tests on the box, packed with the commodity which it is to hold, are necessary to make certain that all the qualities desired are actually present. Each commodity should be studied before a package is constructed for it. Nor is the nature of transportation always the same. Packages for foreign service are subjected to severer hazards than those shipped to domestic markets and should be protected accordingly.

Quality and Condition of Lumber.—"Boxes should be manufactured from lumber which is sound (free from decay and dote) and well seasoned. The average moisture content of the wood should be from 12 to 18 per cent, based on the weight after oven-drying.

"The following chart shows the effect on the strength of the box caused by the moisture condition of the lumber and the change of moisture condition in storage.

MOISTURE CONTENT

	Strength Relation
	Per cent
Nailed and tested at once at 15 per cent moisture	100
Nailed and tested at once at 30 per cent moisture	90
Nailed at 15 per cent, tested at 5 per cent moisture, 4 months' storage	75
Nailed and tested at once at 5 per cent moisture	50
Nailed at 30 per cent moisture, tested at 5 per cent moisture, one year in storage	15
Nailed at 5 per cent moisture, tested at 35 per cent moisture, stored 2 weeks in exhaust steam	10
Nailed at 5 per cent moisture, dried at 4½ per cent moisture, tested at 35 per cent moisture, two weeks in dry storage, two weeks in steam	10
Nailed at 5 per cent moisture, steamed at 35 per cent moisture, tested at 4½ per cent moisture, two weeks in steam storage, two weeks in dry storage	10

"Lumber should be free from knot holes and loose or rotten knots. Knots whose diameter exceeds one-third the width of the board, measured as in Figure 1, should not be permitted, and no knots should be permitted which interfere with the proper nailing of the box.

Weight and Interchangeability of Species.—"The results of the drum tests, combined with the data developed by thousands of tests on many species of woods under varying conditions of locality, state of dryness of the wood, weight, hardness, shock-resisting ability, resistance to nails, tendency to split, et cetera, as well as by tests of the holding power of the various sizes and kinds of nails, screws, strapping, and the like, have made it possible to group the woods generally used in packing boxes into four groups, such that, in a general way, any wood in one group substituted for any other wood in the same group and built into a box of the same specifications, would give practically the same results in commercial service. These groups are given in Table 1, which also gives the average weight of the various species in pounds per square inch surface measure, on various thicknesses of box lumber, air dried (an approximate moisture content of from 12 to 18 per cent based on the weight of the wood after oven drying)."

Barrels.—In this book the discussion of packing containers has been to a considerable extent limited to cases, crates and bales, but there has been frequent mention of shipments in barrels, and certain commodities, for example, cement, oils, greases and so on, are very generally shipped in barrels. Moreover, it will be found that the barrel invades many other lines as a container, and this fact is brought out in the description of packing of chains and other metal goods. The importance of the barrel should therefore not be minimized, and we present with this chapter five photographs which show that the Forest Products Laboratory at Madison, Wisconsin, has not been unmindful of this fact.

The Department of Agriculture's figures on cooperage production, the latest statistics available being those for 1918, show some very interesting totals. In this year the reported production of tight cooperage stock

TABLE 1—APPROXIMATE AVERAGE WEIGHT OF VARIOUS SPECIES OF WOODS USED IN PACKING BOXES, IN POUNDS PER SQUARE INCH SURFACE MEASUREMENT FOR USUAL PACKING BOX THICKNESS. SPECIES IN AIR DRIED CONDITION, 12% TO 15% MOISTURE CONTENT.

Species	Thickness							
	7/8"	13/16"	3/4"	5/8"	1/2"	3/8"	5/16"	1/4"
Group I	Pounds per sq. in. surface measurement							
White Pine	.014	.013	.012	.0098	.0078	.0059	.0049	.0039
Norway Pine	.017	.016	.015	.012	.0098	.0074	.0061	.0049
Aspen	.014	.013	.012	.0098	.0078	.0059	.0049	.0039
Spruce	.014	.013	.012	.010	.0081	.0060	.0050	.0040
Western Yellow Pine	.013	.012	.011	.0094	.0075	.0056	.0047	.0038
Cotton wood	.015	.014	.013	.010	.0084	.0063	.0052	.0042
Yellow Poplar	.014	.013	.012	.010	.0081	.0060	.0050	.0040
Balsam Fir	.013	.012	.011	.0094	.0075	.0056	.0047	.0038
Chestnut	.015	.014	.013	.011	.0087	.0065	.0054	.0043
Sugar Pine	.014	.013	.012	.0098	.0078	.0059	.0049	.0039
Basswood	.013	.012	.011	.0094	.0075	.0056	.0047	.0038
Cypress	.017	.016	.015	.012	.0098	.0074	.0061	.0049
Willow	.014	.013	.012	.010	.0081	.0060	.0050	.0040
Noble Fir	.014	.013	.012	.010	.0081	.0060	.0050	.0040
Magnolia	.018	.016	.015	.013	.010	.0076	.0063	.0051
Buckeye	.013	.012	.011	.0091	.0072	.0054	.0045	.0036
White Fir	.013	.012	.011	.0094	.0075	.0056	.0047	.0038
Cedar	.016	.015	.013	.011	.0090	.0067	.0056	.0045
Redwood	.013	.012	.011	.0091	.0072	.0054	.0045	.0036
Butternut	.014	.013	.012	.0098	.0078	.0059	.0049	.0039
Cucumber	.017	.016	.015	.012	.0098	.0074	.0061	.0049
Alpine Fir	.012	.011	.010	.0083	.0067	.0050	.0041	.0033
Lodgepole Pine	.015	.014	.013	.010	.0084	.0063	.0052	.0042

Species	Thickness							
	7/8"	13/16"	3/4"	5/8"	1/2"	3/8"	5/16"	1/4"
Group II	Pounds per sq. in. surface measurement							
Southern Yellow Pine	.020	.019	.017	.015	.012	.0087	.0072	.0058
Hemlock	.015	.014	.013	.010	.0084	.0063	.0052	.0042
Virginia and Carolina Pine	.020	.018	.017	.014	.011	.0085	.0071	.0057
Douglas Fir	.017	.016	.014	.012	.0096	.0072	.0060	.0048
Larch	.019	.017	.016	.013	.011	.008	.0067	.0054
Group III								
White Elm	.017	.016	.015	.012	.0098	.0074	.0061	.0049
Red Gum	.018	.016	.015	.013	.010	.0076	.0063	.0051
Sycamore	.018	.016	.015	.013	.010	.0076	.0063	.0051
Pumpkin Ash	.019	.017	.016	.013	.011	.0080	.0067	.0053
Black Ash	.018	.017	.016	.013	.010	.0078	.0065	.0052
Black Gum	.018	.017	.016	.013	.010	.0078	.0065	.0052
Tupelo	.019	.017	.016	.013	.011	.0080	.0067	.0053
Maple, Soft or Silver	.017	.016	.015	.012	.0098	.0074	.0061	.0049
Group IV								
Hard Maple	.022	.020	.019	.016	.013	.0095	.0080	.0064
Beech	.022	.020	.019	.016	.013	.0095	.0080	.0064
Oak	.023	.022	.020	.017	.013	.010	.0083	.0067
Hackberry	.019	.017	.016	.013	.011	.008	.0067	.0053
Birch	.022	.020	.019	.016	.012	.0093	.0078	.0062
Rock Elm	.023	.021	.020	.016	.013	.0098	.0081	.0065
White Ash	.019	.018	.016	.014	.011	.0082	.0069	.0055

amounted to 286,401,000 staves and 20,711,271 sets of heading. The output of staves was 24 per cent smaller than in 1909 and 20 per cent smaller than in 1911, while the manufacture of heading was less than 1 per cent under that of 1909 and 32 per cent under 1911. For staves the slack cooperage production for 1918 was 50 per cent under 1909 and 24 per cent under 1911, and the heading production showed a decline of 57 per cent and 43 per cent as compared with 1909 and 1911 respectively.

From these figures it is evident that important changes have taken place in the cooperage industry during the past ten years. Demand for certain types of barrels has fluctuated with the popularity of various styles of containers, while the increasing use of containers made of other materials has had a marked effect on the production of cooperage stock. This is equally true whether we consider tight or slack cooperage. The use of the latter style of barrel has been greatly modified by the increasing use of sacks as well as that of the veneer barrel or drum. However, the increased use of barrels for packing lime and cement, as well as farm produce, has done much to maintain the cooperage industry at a fairly high productive level. The prohibition movement has also greatly affected the demand for tight cooperage, and while millions of beer and ale staves were produced in former years, in 1918 the production was measured by a few hundred thousands.

Mr. Hu Maxwell writes interestingly in *American Forestry* on the subject of cooperage, in part, as follows:

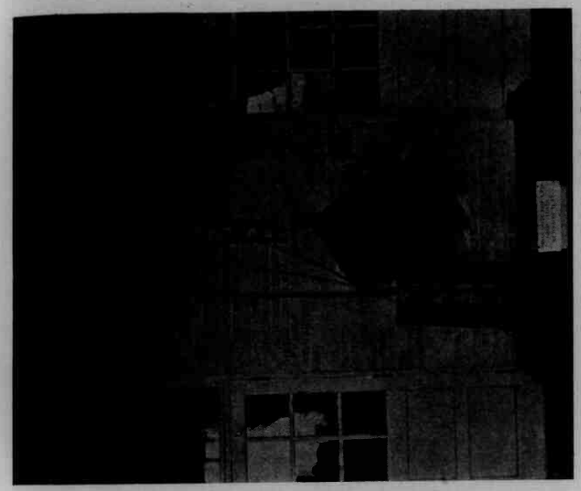
Kinds of Cooperage.—"There are two kinds of cooperage, commonly distinguished as 'tight' and 'slack.' Tight vessels are intended for liquids; slack for dry articles. Classes and grades come between the two extremes. The barrel that carries alcoholic liquors is considered the highest class of tight cooperage, while the vegetable barrel is typical of slack containers. The slack barrel end of the business is the larger, judged by the quantity of wood required in manufacturing the product; but tight barrels demand a much higher grade

of wood. The value of the slack stock used in the country is nearly 50 per cent more than the value of the tight material. Nearly any wood is suitable for some kind of slack cooperage, but only a few are serviceable for tight.

Woods Used.—"Room exists for considerable choice of wood for staves in slack cooperage, but not so much for containers of liquids. Flour barrels were once made principally of cottonwood staves, but elm has proved to be a good substitute. A white wood that represents a clean appearance is wanted, and it must be tough enough and strong enough to carry the load. It must be free from odor or taste that might injure the contents. The sugar barrel demands material of the same kind.

"Red gum leads all other woods because it is abundant and satisfactory. The shippers of butter, lard, meat and other food products select the most suitable woods for their barrels. Custom has much to do with it, but not all; for it is easy to understand that a pine barrel might taint food with the taste of turpentine. The hardwoods are demanded in three times the number for slack barrels as are the soft-woods; yet many commodities go to market in soft-wood barrels and kegs. Scrub pine is used for nail kegs and for containers of other small hardware.

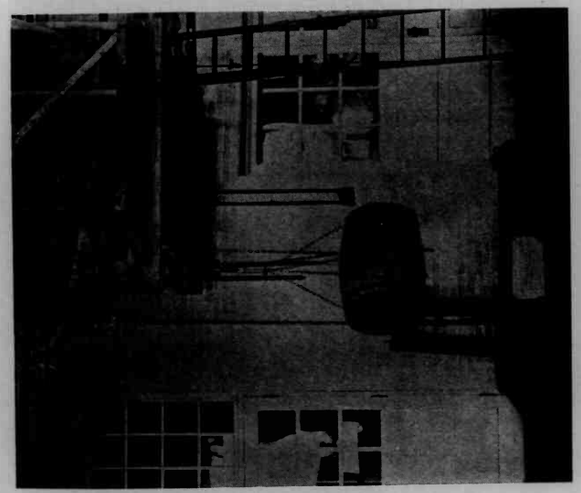
Wide Use of Cooperage Stock.—"Extensive use is made of barrels and kegs as shipping containers, and in some places they compete with boxes, while in others they hold the field to themselves. The life of a barrel is put down at one year by the trade, but that is not enough. A majority of barrels are used many times. They begin as sugar or flour barrels, and are then sold to the farmer for shipping his produce to market. It may be said that they are returned to him several times, carrying potatoes to the market on the first trip, and tobacco or lettuce on the next, each cargo being lighter in weight than the previous one, owing to the weakened condition of the barrel. Finally the barrel may serve out its life work as a trash receptacle, and in the end can be used for fuel. Thus it may be said that a barrel fills as useful a career



Courtesy of Forest Products Laboratory.

DIAGONAL DROP TEST FOR BARRELS.

The test is identical with the side drop test, except that barrel is dropped on edge.



SIDE DROP TEST FOR BARRELS.

Barrel is dropped on wooden platform covered with steel plate and resting on concrete flooring.

INTENTIONAL SECOND EXPOSURE

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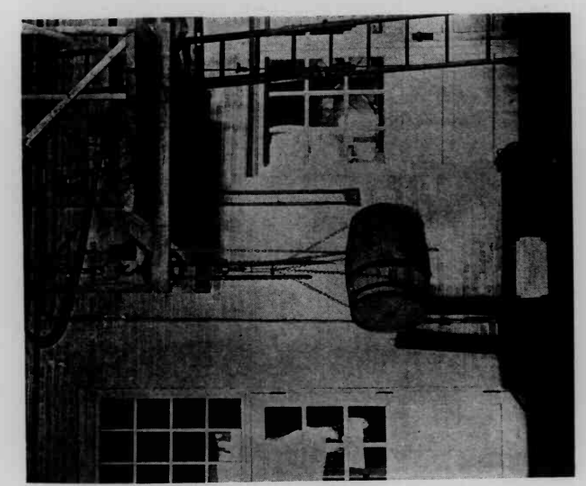

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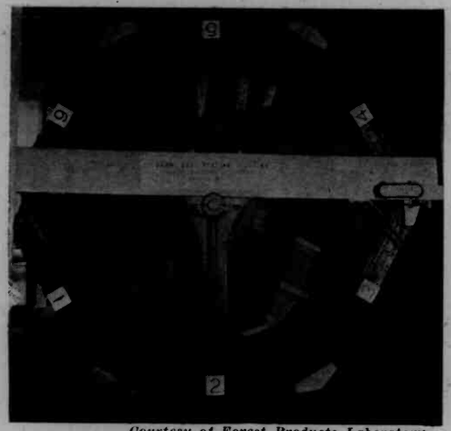


Courtesy of Forest Products Laboratory.

SMALL HAZARD MACHINE.

Employed in testing boxes up to 2½" in their greatest dimensions. Machine revolves vertically. Inside of drum contains ridges of wood and metal. With each revolution the box tested drops six times.

Courtesy of Forest Products Laboratory.

INTERNAL PRESSURE TEST FOR BARRELS.

Barrel and connecting pipes filled with water to exclude all air. Pressure is then progressively raised until 1 lb. of water escapes from barrel in one minute.

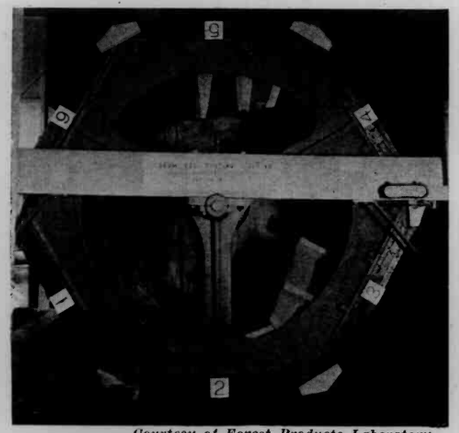
as almost any other manufactured article, and its life is much longer than a season.

"The demand for barrels is constantly growing, because modern machinery has made it possible to make them for the trade cheaper than almost any other form of durable package. That it is the most convenient form of package has long been acknowledged.

"The heaviest demand comes from the cement business, and flour ranks next, closely followed by sugar and salt. As containers for fence staples, bolts, nuts, nails, and packages for roasted coffee, spices, crockery, fruits, and vegetables, they follow in the order named. Glass manufacturers, baking powder companies, liquor distillers, and candy, tobacco, and cheese packers are big users of barrels. The demand for barrels for molasses, oil, lard and pork is also enormous, while dry paint, glue, snuff, oatmeal, screws, castings and general hardware articles annually increase the demand on the cooperage supply.

Characteristics of Woods.—"Some woods are waterproof, others are not. Alcoholic liquors and some oils will pass through the pores of some woods where water will not go. The wood of which a whiskey barrel is made may absorb a gallon of whiskey without any passing through the staves and escaping. Some woods are so porous that barrels made of them will not hold water very long. Coopers learned by experience that certain kinds of wood made better staves than others, when the barrels were intended for liquid. It was wholly a matter of experience at first, but later the microscope helped to explain why some are proof against seepage and others are not. All wood is more or less porous. It is made up of hollow cells, connected one with another by small openings, all microscopic in size; but some of the hardwoods have openings much larger than cells. They are tubes running through the wood, up and down the trunk of the tree, and are called pores or vessels. Some of them, as in oak and ash, are large enough to be seen by the unaided eye, by inspecting the end of a freshly cut

INTENTIONAL SECOND EXPOSURE



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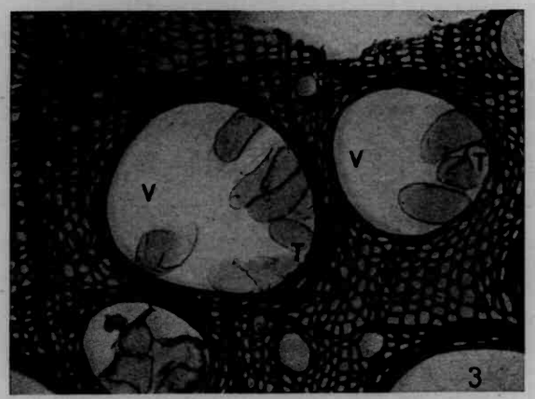
stick. These pores are responsible for the fact that some barrels will not hold liquid. It seeps into the pores and flows along them until it passes entirely through the staves and escapes. That is why wood with large open pores is not suitable for tight barrels.



Courtesy of American Forestry.

Photograph shows tyloses in process of plugging white oak pores.

"White oak has always been considered the best tight cooperage wood. Many years ago it was thought that no other could or should be used for certain liquid commodities, but others have lately come into use. Yet, white oak has large pores, and a casual observer noting that characteristic would conclude that it is not good for tight barrels, but experience shows it to be good. Though it has large pores, which may be easily seen, they are not open. They are closed as a bottle is closed with a cork, and liquid cannot enter. The plugging substance, which is known as *tyloses,* is of a whitish color and is deposited in the pores by the wood itself, in the progress of the tree's growth and maturity. It occurs principally after the sapwood has changed into heartwood. Red

oak's pores are not plugged. Therefore red oak is not suitable for the best kind of tight cooperage. The condition of the pores, whether they are plugged or not, explains why fewer woods are available for tight than for slack cooperage. Only the best wood is used as barrels for alcoholic liquors; but some other woods will do for other kinds of liquors, such as brine for pork, vinegar for pickles, and for certain oils."

Descriptive of the tests on barrels made by the Forest Products Laboratory we show herewith five cuts, the first illustrating the side-compression test. In this test the barrel was placed between two flat surfaces and compressed in the direction of its diameter. The rate of compression was 0.25 inch per minute and simultaneous readings of load, compression and loss of water from the barrel were taken. The test was discontinued when one-half the water had escaped.

The second test is known as the diagonal-compression test, the barrel being compressed between two flat surfaces and supported on one edge or chime and loaded on the other. The rate of compression in this case was the same as in test number one. The side-drop test is shown in plate three, in this case the barrel being dropped on a wooden platform about 3½ inches thick which was covered with a steel plate ⅛ inch thick, the platform resting on the concrete floor of the laboratory. The first drop was three inches, the next six, and so on, the length of drop being increased three inches each time. The test was continued until one-half the contents of the barrel had escaped.

The diagonal-drop test, shown in plate four, is the same as the side-drop except that the barrel is dropped on the edge. In the internal pressure test, plate five, the barrel and connecting pipes were filled with water in such a way as to exclude all air as far as possible. The pressure was then raised to two pounds per square inch and held for two minutes. The pressure was then raised to four pounds and held for two minutes. The process was continued, increasing the pressure two

pounds each time and holding it constant for two minutes, until one pound of water ran from the barrel in one minute or less. With the data of these tests as a guide the laboratory was able to suggest some very valuable improvements in the barrels experimented with.

This chapter should be read in connection with other chapters of this book, which mention and discuss barrel containers. In the chapter on cement will be found interesting data and photographs.

CHAPTER VIII

CLIMATE AND PORT FACILITIES AFFECTING MANNER OF PACKING

PROVIDING for transhipment is not alone a question of export packing sufficiently good to stand being taken from the ship's hold and dropped into a lighter, frequently under very severe conditions; it may involve much more than that. For example, after the package is taken from the ship it may be necessary to tranship it by cart, burro, llama, bullock, camel, man, or in some other way. Therefore it is not alone a question of packing goods well, it is also a question of packing them to meet these special conditions. Generally it may be said that a mule can carry from 200 to 250 pounds, a burro from 150 to 200, a llama about 100, and a camel from 350 to 450. In making up packages for transportation by any of these beasts, however, the package should be only one-half of the indicated weight. Transportation by animals generally takes place by strapping a package on each side of the beast, so as to balance the load. Thus the mule would carry two packages of 100 pounds each, the burro two of 75 to 100, and so on. With reference to human transportation the weight that can be carried varies greatly. Any one who has seen the Mexican *peon,* a Peruvian Indian, or a Turkish *hammal* (porter) trotting along under huge burdens would be inclined to conclude that there was almost an unlimited capacity. But it may be stated that the general average load for a man is from 100 to 150 pounds.

Climatic Conditions as Affecting Packing.—Climatic conditions have a very important influence on the character of the package, and this offers another opportunity to insist on a little preliminary study of geography. This statement applies no matter what the direction of

the compass. For example, a shipment may be going to Nova Scotia and the manufacturer may think that his usual Canadian packing will suffice, but he overlooks the fact that the climate of Nova Scotia is very damp and that his metal goods should be much more carefully protected than is the case for shipments to more usual Canadian points. Moving to another part of the world, to Honduras for example, we find that the rainy season lasts for from five to six months, and the rainy season there is no mere figure of speech as it is in many cases.

In Honduras goods must be carefully packed for protection against moisture if the shipment is to arrive in good shape. Shipments for Salvador or Peru which are transhipped into lighters are exposed to sea water, while exposure to torrential rains is characteristic not alone of shipments to Colombia and many parts of South America, but also to many other sections of the world.

Another peril goods have to face is intense heat. It frequently happens that goods are stowed near the boilers of ships or that they are subject to intense tropical heat, as in Colombia or India. Moreover, in many countries the air is heavily charged with humidity, to such an extent that fungoid growths are produced frequently destroying or rendering useless many valuable shipments. It may be that the foreign buyer is unreasonable in expecting the exporter to know all about these many different conditions, and not alone to know about them but to guard against them by packing that protects the goods. But, be this as it may, there are some exporting houses that *are* acquainted with the conditions and that take proper precautions to protect their shipments, and these are the houses that eventually get the business.

What They Do in the Ports.—Another important point to be considered is the port conditions. Because we have ideal port conditions in New York and in many of the other shipping centers of the United States, it does not follow that there is anything similar in other countries. To be sure, there are countries where port conditions are superior even to those of the United States, but none

the less there are vast sections of the world where port facilities are practically unknown, and this is true particularly of many parts of South America. Later in this chapter there will be quoted a description of transhipment at a South American West Coast port.

Foreign Transportation and Its Difficulties.—Goods may be carried for many days in ox carts, as is the case in Honduras. Goods sent by parcel post, packed by the Post Office in bags or cases, are tossed from a wagon to a wharf, from wharf to the hold of the ship with other packages of various descriptions on top as a rule, and when taken from the ship they are dropped into a lighter and again and again go through the same process, each time receiving shocks of various kinds. Or it may be, as in Colombia, that the lighter packages are usually selected by the porters and muleteers, and the heavy boxes left until such time as conditions admit of their transportation. But this time may be many weeks, even months, after the arrival of the goods, and many things may happen during these weeks and months.

Where Conditions Are Trying.—The two principal conditions existing in foreign markets which require the attention and consideration of American shippers in preparing their packages for export, are climatic conditions as existing in the tropical countries, of which India may be taken as one of the most striking illustrations, and the primitive development, even the total lack, of harbor and port facilities which many ports in Central and South America may best illustrate. Many Americans who have not traveled widely over the world have not the faintest conception of what a really tropical climate means with its excessive humidity, its rainy and its dry seasons, the danger of ravages by insects, etc. Similarly, few people who have not seen for themselves or studied in books or photographs the conditions under which goods are landed in some of the Latin-American ports, can begin to understand what it is like for a steamer to anchor from two to four miles off shore and tranship its cargo into lighters bobbing up and down in a heavy

swell; even landing their passengers in lighters or tenders, to which they have to be transferred from the steamer in baskets lowered by derricks, because of the impossibility of climbing up and down a ship's ladder in a heavy sea. There is not space in these pages for detailed descriptions of the climate of all countries of the world, nor of the facilities existing in the hundreds of seaports of the world. Certain vivid illustrations may be here printed which will suffice to convey a more or less adequate impression of actual conditions such as those just referred to.

What a Tropical Climate Means

India offers us a classic example of conditions in a tropical country, and while a number of the cities of British India have magnificent docks, none the less the packing problem for goods shipped to India is a very serious one. First, we have conditions of interior transportation which, in a large part of the country, are primitive to a degree, and added to this are transhipments which goods sent out from the United States must sometimes suffer. However, the chief hazard is climatic, and this hazard begins to operate long before the goods reach India, when, for example, they pass through the Suez Canal and begin their journey through the Red Sea. The terrific heat here makes itself felt, the iron sides of the ship becoming so hot that one cannot touch the plates with one's hands in comfort, and hazards increase the nearer the goods are brought to India. A writer in the *Indian Textile Journal,* of Bombay, has this to say of the climatic situation, his remarks applying in general terms to any other tropical, damp climate:

Rainfall.—"The rainfall in India, which all takes place within four to five months, contributes largely in giving to the climate its peculiar character. Averages at various cities follow: Bombay 72.25 inches, Karachi 7.34 inches, Hyderabad (Sind) 8 inches, Nagpore 45.09 inches, Allahabad 38.51 inches.

Transportation in Turkey.
Eight men are shown carrying a hogshead in Constantinople.

Courtesy of The Americas.

Mollendo, a Typical Port of the South American West Coast.
Goods are landed into lighters in the open water of the Pacific.

INTENTIONAL SECOND EXPOSURE

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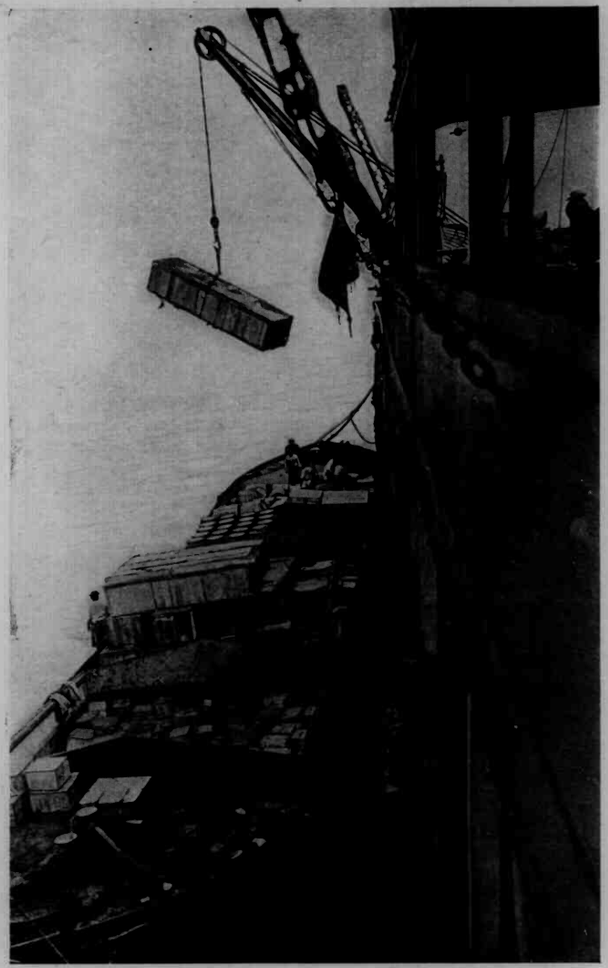

Courtesy of The Americas.

UNLOADING FREIGHT AT ARICA.

Photograph shows knocked down motor trucks being lowered into a lighter over the side of a ship.

"The effect of heavy and continuous rain in the tropics is to produce a dampness in the air quite unknown in Europe, and which is very destructive to many articles of European manufacture. The moisture and heat combined set up all kinds of fungoid growth and decay in goods which are quite unaffected by the climatic conditions of Europe. Mildew attacks textile goods, leather, books and stationery; arms, cutlery and metal work require constant supervision to preserve them. European furniture of wood is soon spoiled by swelling and shrinkage, or by borer worms; and liquors, excepting the strong alcoholic ones, rapidly deteriorate in the heat of India. Perishable goods soldered up in tin lined cases are not safe if they have been packed in Europe in wet weather. The heat of the ship's hold in the Red Sea, or that of a closed iron wagon on the Indian railways, when the iron may acquire a temperature of 160 degrees in the sun, will start mildew in the case by the aid of the moisture within it. Straw and shaving packings hold a good deal of moisture in damp weather, and do much mischief when sent to the tropics. No merchandise, therefore, that is liable to injury from heat or moisture can be stored long in India without serious deterioration.

Books in India.—"Books if bound with ordinary paste are quickly attacked by mildew and by vermin. Beetles will eat off the surface finish from stamped cloth covers. The paste should be mixed with corrosive sublimate or other antiseptic. Books on shelves, unless packed tight, are all hanging by the binding, and a warm, damp atmosphere loosens them from the covers if they are large. All large books for use in the tropics should be bound so that when placed upright on a shelf the leaves would rest on the shelf, that is to say, the covers should be cut flush with the leaves on the under side. The appearance of such a volume might provoke criticism, but it would never lose its cover in the manner described. Books sewed with wire go speedily to pieces in the tropics. Since wire sewing has been introduced, a very foolish economy has substituted tinned iron wire for tinned

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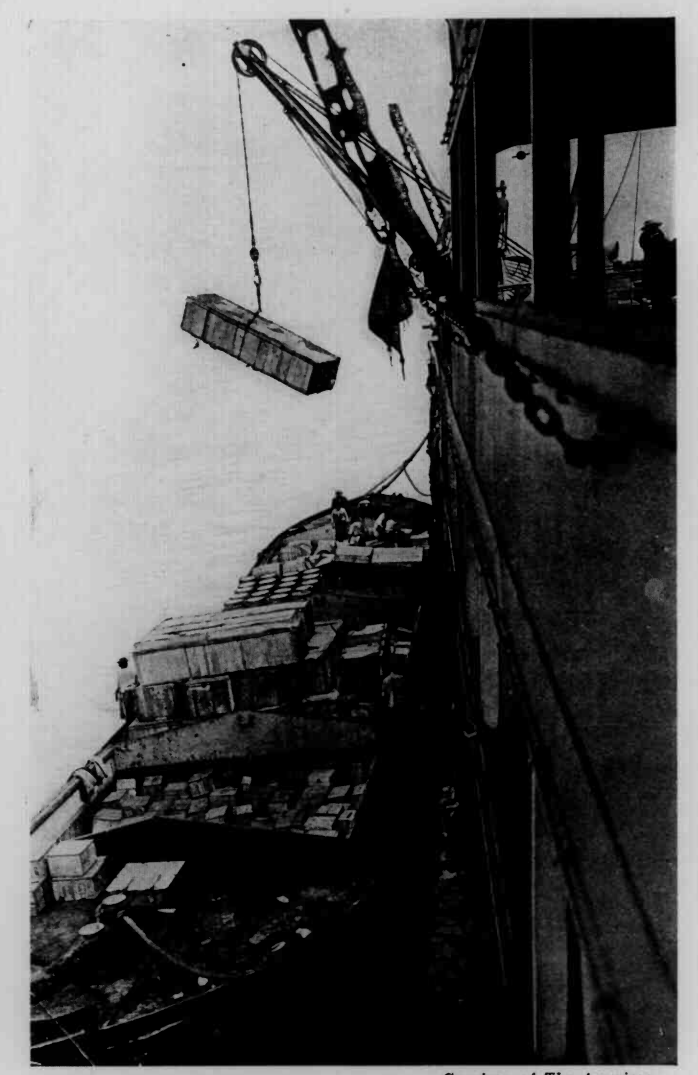

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copper. The tinning soon disappears from the iron and the book soon falls to pieces.

Oils and Drugs in India.—"Barrels containing oil are very quickly affected by a hot and dry atmosphere. The moisture from the wood is evaporated more quickly than the oil can replace it and leakage begins unless the hoops are set up. Oil, therefore, can be safely stored only in iron tanks. Drug compounds and proprietary medicines are also specially affected in the tropics. Pills lose in time their capacity to dissolve, and gum capsules, by oxidation, become practically waterproof in spite of every possible care having been taken of them.

Manufactures of Steel in the Tropics.—"Steel or iron instruments or weapons meant for use in the tropics should be kept in cases without any linings. Velvet, silk, plush, cloth or leather linings all absorb moisture and cause the instrument to rust. Nothing will keep them so well as linings of baywood or other absorbent timber which has been well painted, while hot, with a melted paraffin wax. No wax need remain on the surface, but if the pores are properly filled the trouble and loss due to rusting of valuable instruments or weapons may be avoided. During the monsoon rains all wooden cases containing merchandise for transport must be covered with pack sheeting and tarred unless they are tin lined.

Drying Merchandise in India.—"The process of drying merchandise, whether it be textile goods or other materials, demands special arrangements during the rains that may fall for weeks together with very little intermission, and the storage of dried and other goods, such as tobacco or provisions, has still to be provided for. It may not improbably be found in connection with the ice factories that are becoming common in India, and which, by means of suitable extension, might provide cool storage, as is already done in New York. A sufficient reduction of temperature stops the action of moisture even on the most perishable goods. This may be observed in the case of fish and meat, which in Bombay are tainted in a few hours after death. In cold weather in

Europe they will keep for several days, and if well frozen they may be preserved indefinitely.

Absorbents and Repellents Required in India.—"Much has already been done for the preservation of perishable goods on a small scale, and the use of absorbents in air tight cases is a great aid in the preservation of samples used in commerce. Lime, chloride of calcium, salt, dried sawdust, and sulphuric acid have their uses as absorbents of moisture, and should all be known and understood in a well arranged sample room.

"Glass showcases should have a floor as well as top and sides of glass, for a wooden floor, being permeable to moisture, will absorb water vapor from the air and transmit it to the atmosphere of the case. There is thus a flow of moisture through the wood which must either be taken up by absorbents or left to deteriorate the contents of the case. No showcase is absolutely tight, unless it be a bottle with the stopper cemented in place. There is therefore a circulation of air in and out, which is controlled by and due to the fluctuation of barometric pressure twice in every 24 hours. Every closed vessel breathes twice a day, the inflow carrying with it dust and moisture. The dust settles in the still air of the case and the moisture is taken up, partly by the absorbent and partly by the articles within. It is this fluctuation of air pressure that gives movement to the aneroid barometer. Camphor has for a long time been used to repel the attacks of vermin upon furs and textile fabrics, but it is now being abandoned in favor of naphthalene and benzine, whose odor is particularly repugnant to insects of all kinds. Kerosene is also much disliked by them, but being much less volatile its use is limited. Ants will not crawl up the leg of a table or bed around which a rag dipped in kerosene has been tied, and suspended meat safes may be protected in the same way, with a rag tied around the suspending cord.

Advantage Taken of Dry Season in India.—"Machinery, especially that for textile factories, is imported during the dry season. If it has to be conveyed far from

the port of discharge, the makers should be carefully informed regarding the kind of land carriage that will be employed to deliver it. If there is much transport by road, as may easily happen, the quality of the road, the inclines, bridges, and fords should all be carefully examined and reported on, as it might be necessary to restrict the maximum weight of the heaviest article to meet the peculiarities of transport."

Displaying Hardware in India.—Shopkeepers in India have difficulty in making their show windows and even their counter showcases attractive, when they wish to display bright steel goods, especially cutlery. If a pocket knife, for example, is displayed in a show window for a single day or two it promptly rusts and becomes unsaleable and unuseable. Accordingly, the spectacle is common, but by no means attractive, of a handsome display of cutlery and other bright steel goods in hardware show windows all thickly coated with vaseline.

How Indian Druggists Keep Rubber Goods.—The only way that retail drug shops in India can satisfactorily carry in stock the necessary supplies of rubber sundries, syringes, ice bags, hot water bags, etc., is by keeping their reserve supplies in their cellars, under water. If kept on the shelves in the way in which American druggists carry such stocks these rubber goods would spoil in a week or two at the outside.

Packing Dry Products and Chemicals for the Tropics.—The Indian agents of a large British firm wrote recently in the following terms regarding packing for India: "The packing that will do for temperate climates, or even some other tropical countries, is in many cases absolutely unsuitable for India. Take, for instance, such things as dry products in the shape of milk foods, etc., and powdered forms of chemicals. It is absolutely essential in most cases that these shall be packed in glass containers, otherwise the humidity of the climate causes metal packings to sweat and the contents to become spoiled. In such matters, also, as the packing of heavy chemicals for the milling industries—nitric, sulphuric,

and other acids—the packing preferred for these, instead of being carboys, is 28-pound earthenware jars, packed two in a case, the cases being very strong to prevent breakage. In all instances hooped packing cases should be used, as the goods are subject to very rough handling by the native labor at the docks and railways."

Packing for Burma.—Burma and in fact all territories in this part of the world are very like India so far as climate is concerned, but it should be especially noted, in addition to packing for climatic conditions, that away from the main river and railway transportation system these countries are dependent on bullock carts traveling on soft bottom roads which are only tracks. It is always to be remembered that native Indian labor is far from intelligent and is taught and educated with some difficulty.

The West Coast of South America.—A large exporter of rubber goods has, in the following letter to the author, given a very good idea of conditions existing along the West Coast of South America which, in a general way, may be taken as further typical of conditions at many other ports, especially those of Central America and the west coast of Mexico:

"To appreciate fully the need for greater care and more efficient packing one should really take a trip down the West Coast of South America as far as Mollendo, Peru, and then journey inland as far as Cuzco, or up over the mountain passes to Cerro de Pasco and Huánuco.

Unloading Cargo.—"In most instances all freight for the West Coast of South America must be unloaded from the steamer into a launch or lighter in the open bay or roadstead, and then to the dock or pier, while the lighter is often tossed about on the breakers. These lighters or barges come out from shore on the arrival of a steamer, fasten to her with a bow and stern line, then swing clear, as the ocean swell keeps both barge and steamer moving and their up-and-down motion is by no means coincident. A sling full of merchandise consisting, say, of a box, a barrel, and a crate, weighing perhaps 1,500 pounds, is

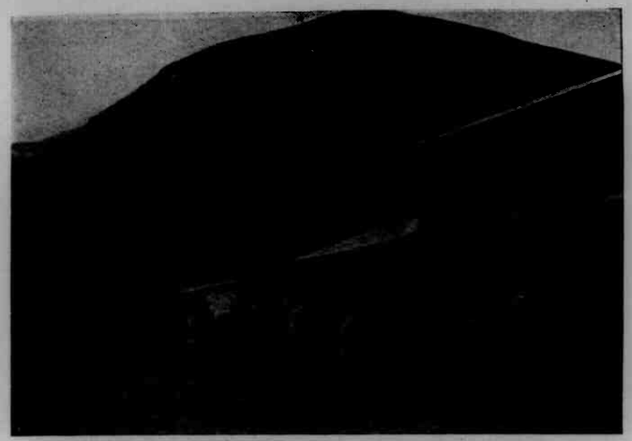
swung over the ship's side and lowered to within 15 or 20 feet of the water. When the barge comes beneath the swinging sling down goes the merchandise with a rush to catch the barge. The package on the bottom receives the full force of the impact.

"In many ports on this coast there is further rough handling after the goods are landed. There are few trucks in the warehouses, and much of the merchandise is transported on the shoulders of men, who, instead of lowering their burden easily or having someone help them, simply stand erect and let the cases fall. Moreover, warehouse accommodations may not be sufficient for all goods landed. In such instances the shipments are liable to damage by exposure to the elements.

Interior Transport in Peru.—"Another fact usually lost sight or by the exporter, is that after arrival at the port of destination a considerable amount of the shipment has, in all probability, to be transported inland over devious mountain trails or through jungle paths before it reaches its final destination.

"Take, for example, goods that are consigned to Tarma, Huánuco or Mayobamba in the interior of Peru. As vehicular traffic, owing to the narrow roads and mountain passes, is impossible, all inland transportation is effected by burro or mule trains. The muleteers and cargo dories are no respecters of merchandise and in consequence it is no uncommon sight to see the trails strewn with goods. In many places the old Inca trails are so narrow in the mountainous regions that two burro trains cannot pass one another without one string of donkeys being faced to the inside wall of the trail while the others pass by, picking their way carefully along the edges of the precipice which frequently has a sheer drop of several hundreds of feet.

"As another example of the necessity for strong and proper packing, let us follow the routine of one of our shipments to our branch at Santiago, Chile. This is what takes place after the ship has anchored at its destination and starts discharging cargo.



LLAMA PACK TRAIN IN PERU.

Method of transporting goods in the interior of Peru.

Courtesy of The Americas.

UNLOADING FLOUR FROM A LIGHTER.

Typical West Coast method of unloading flour and other goods.

INTENTIONAL SECOND EXPOSURE

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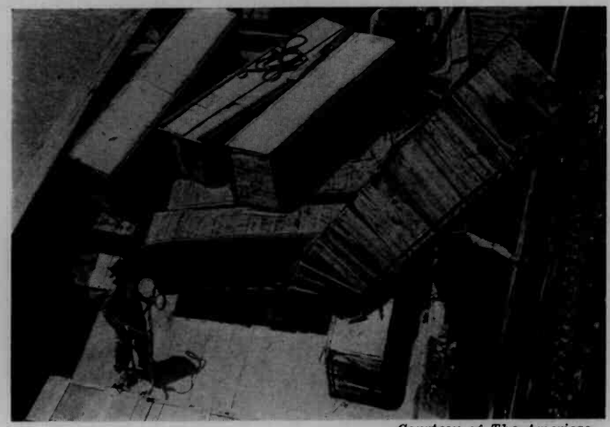

Courtesy of The Americas.

UNLOADING OF AUTO TRUCKS.

Note the condition of the case being lowered, due to bad packing.

Courtesy of The Americas.

BADLY PACKED AGRICULTURAL IMPLEMENTS.

Shows damaged condition of case when it arrived in Chile.

Follow This Shipment to Chile.—"In many cases the packages are unloaded from between decks, being drawn to the hold by the sling, from there lifted over the side to be dropped into lighters which sometimes have a perpendicular movement of 15 feet. In no case is any care used by the officer in charge of the unloading to see that the packages land in the lighter as they should. As many of the lighters are two or three hundred tons, it is necessary to pack case on case, sometimes as many as six or eight layers of cases of different sizes and construction. The lighters are then moved to the dock where the packages are unloaded by slings and again receive rough treatment in dropping onto the dock. From the dock to the custom house car the packages are handled by slings and, as the cars are very small they are loaded with from two to five layers of cases. The car is moved to the warehouse of the custom house and cases dropped to the cement floors. After documents are presented for dispatch, packages are again loaded onto the same style of car in the same manner and taken to the Revision Department of the custom house and again dropped to the floor. After revision they are again loaded onto the car and taken to the street, where another unloading operation is performed. From the street the packages are loaded to the dray which takes them to the railroad station, where they are dumped on the platform. From the platform another handling is made to the car. Arriving at destination, it is customary to load the drays several layers deep, and arriving at the branch the packages are unloaded in the street. The packages from the higher layers are, in most cases, dropped to the street which is granite paved. From the street they are rolled into the branch. The warehouse being in the cellar of the building, it is necessary to lower these packages by sling to the floor of the warehouse.

"All these conditions must be taken into account by us if we desire our goods to reach their destination intact and our customers to be satisfied. Ignorance of the treatment his goods will receive during transportation to con-

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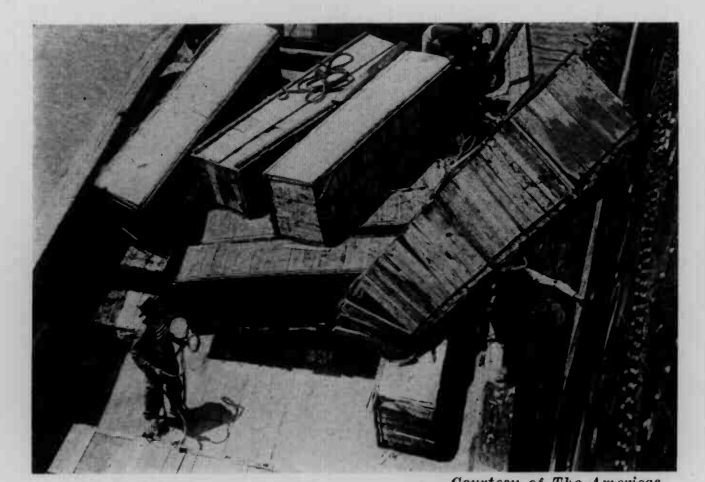

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sumer excuses no exporter; instead, it creates an unfavorable opinion not only of the individual shipper but of all American exporters."

Heavy Weights to be Avoided.—A British government report recently commented at length on ways in which merchandise of many different descriptions ought to be packed, calling especial attention to the recommendations of importers in Valparaiso, Chile, to the desirability of limiting the weight of single packages to about 500 pounds gross because of the fact that in Chile the work of stowing in custom house sheds and delivery to consignee is all performed by manual labor. Importers in Colombia urge that bales and cases should, if possible, not exceed 90 kilos in weight, while on the other hand it is advisable that they do not weigh less than 70 kilos.

Interior Transportation by Muleback.—The well known mule has frequently to be utilized for the transportation of freight to the interior of many Central and South American republics, both because of the absence of wagon roads and because of the perilous nature of many of the trails over the mountain passes where the sure-footed, if obstinate, mule possesses many advantages as a carrier. However, it is highly probable that the extent of the requirement for special packing suitable for muleback transportation has always been much exaggerated. In all countries where an animal's back has to be utilized for carrying freight, the amount of merchandise thus to be transported, almost always to remote and thinly populated and less favored districts, is comparatively small; the great bulk of the imports of the country in question being not only received but consumed in the port cities or the more important places, which, because of their size and demands, have been closely linked with the ports by railways, river steamers or adequate highways. None the less, there remains that part of the import trade of a given country which has to be transported into the interior by pack trains for which careful and special packing must be provided. Take, for example, and by way of illustrating very similar conditions in other countries, the following description of interior transportation in Honduras, which appears in *Central America as an Export Field,* by Mr. Garrard Harris:

Trying Conditions in Honduras.—"Pack train service extends over practically all of Honduras, perhaps half the population or more being dependent on pack trains for goods from the outside world. But it does not follow from this that half the imports and exports of the country are handled by pack trains, for the people in the interior towns and villages depend to a large extent on native produce, and aside from cloths, various kinds of clothing, and some flour, little is transported regularly by pack train. However, such unexpected articles as soda fountains are to be found in some places in the interior, the drums of carbonated water being carried for over 100 miles, and several gold mines have brought heavy machinery at enormous expense 200 miles into the interior.

"Most interior towns are supplied by pack service from the Pacific side of the country, the goods being landed at Amapala, lightered to San Lorenzo, and transported for the most part in ox carts over the cart road to Tegucigalpa, and from there to the interior towns by pack mules.

Weights for Mule Loads.—"The pack trains from Masica, Ceiba and Trujillo must cross the very abrupt and very moist coast range of mountains; consequently the average load is not as large as in other parts of the country.

"The average load for a pack mule in the Ceiba district is approximately 8 "arrobas." An arroba is supposed to weigh 24 pounds and so 200 pounds can be considered the load for one mule. In other parts of the country where the trails are a little better and the grades lighter the average load is 250 pounds, or approximately 10 arrobas.

"An important fact to be borne in mind is that the loads referred to above are mule loads, and that goods must be packed in units having just half the mule load

weight, for it is necessary that the load be evenly divided in separate packages across the animal's back. Packages should not be over 3 feet in length or over 14 inches in any other direction; and those packages, such as bales of cloths, that do not present a square edge are better for packing, although the square edged packages are not hard to handle.

Desirable Packing for Honduras.—"Flour is generally shipped in 12½-pound sacks, which in turn are packed by the muleteers in gunny sacks and covered with waterproof covering. It often happens that the flour arrives in the interior in a damp condition, and if it could be shipped without great extra expense in hermetically sealed tins its arrival at destination in better condition would be insured. All packages should be covered with a heavy paper inside the outer covering, and if possible this should be a waterproof material, such as paraffin paper.

"Small machinery, such as sewing machines, should be shipped knocked down and crated with special reference to the balancing of weights referred to. Pipes, rails, etc., should be cut to 3-foot lengths."

CHAPTER IX

PILFERING

ACCORDING to the statistics of the United States Railroad Administration, the railroads of the United States lost $45,000,000 in 1919 from pilferage. Other statistics tell us that the marine underwriting companies of New York City alone were called upon to pay in 1919 more than $3,000,000 in losses due to the same factor. It is true that this book does not concern itself with domestic conditions, but the two losses mentioned are due principally to the same cause, that is, poor packing. Mr. Robert L. Calkins, freight claim agent of the New York Central lines, states that the "New York Central lines are paying out over a half million dollars monthly in freight claims, the result of thefts and breakage of shipping cases. This means approximately $6,000,000 a year, and it is fast developing into a very serious situation for the railroads of the country. These losses are increasing instead of diminishing. . . . While measures have been adopted with a view of curtailing these huge losses, the wholesale thefts go on just the same and the companies seem powerless to check them. On the New York Central lines alone there are over 400 detectives at work on this matter, yet the claims for losses continue to pour in. . . . Pilferage constitutes nearly 60 per cent of our losses."

On the export side, a prominent marine insurance house stated a few days ago that theft and pilferage of American goods in transit to foreign ports have reached a degree of magnitude which is not only alarming for writers of marine insurance, but promises, if continued, to be a menace to foreign trade. Some marine insurance companies are refusing to grant policies against this type of loss except in a very limited number of cases, while

others, in self-defense, have been compelled to raise rates in proportion to the risk. This risk is estimated by the presidents of several insurance companies to range all the way from 100 to 1,000 per cent greater than before the war.

In marine insurance circles, the increase in pilferage is ascribed to several factors. First, we have bad packing, especially on the part of export concerns that are new in the business, houses that came into existence during the war. These concerns are in the main the cause of the many complaints from consignees; complaints due to second-hand cases, thin lumber, too few nails, lack of metal strapping, failure to use mechanically tightened straps and so on. However, there are other factors producing these very heavy losses, one being the congested conditions existing at shipping ports, while a lowered standard of honesty is alleged by some insurance people to be a most potent element in the situation. It is stated by men in a position to know that in many Mexican, South American and Italian ports thievery is carried on in an organized way, and it is claimed that cargoes to South American ports are subject to pilfering more than those consigned to any other ports. It is said to be impossible for a ship to reach a Chilean port without its cargo having been pilfered to a greater or less degree, and in most cases it is impossible to trace the crime to a person in the United States port, on the ship or in the Chilean port.

Effect of Pilfering on Insurance Rates.—It is interesting to note in this connection that the new policy of the French marine underwriters that went into effect January 15, 1920, takes particular cognizance of losses by theft. So extensive is the pilfering of goods that European marine underwriters have become very much alarmed. Some companies have increased the rate of premium for this class of risk, and others have refused to give coverage for certain South American ports. The new French schedule shows minimum rates for theft ranging from 1s 6d to 80s per cent, and these rates are

to be increased 50 per cent in the case of hosiery, hats, boots, shoes, woolens, perfumery, foodstuffs, and so on.

The rates to different countries for theft insurance vary with the conditions in the foreign ports. The new French tariff ranges from 1s 6d to Canada and the United States, to 80s to interior points in Chile. This latter is equivalent to 4 per cent in the United States. Insurance against theft placed with American companies for the interior of Mexico or the west coast of South America would be at rates ranging from 1 to 5 per cent, while coverage against the same risk on shipments to London or other ports of the United Kingdom might be as low as 25 cents.

Testimony from the Argentine.—In a recent report issued by the United States Chamber of Commerce of the Argentine, it was stated that the increase in pilferage during the past few months had been alarming. "An effort was made to deduce from the evidence received the value of the goods stolen, but this was impossible, although in general terms it would seem to run into hundreds of thousands of dollars in gold. One curious feature developed, and this was that pilferage occurs with frequency in articles sent by parcel post, for which there is no recourse if no value has been declared.

"The thefts have all the characteristics of systematized robbery by people who know the merchandise and also know the peculiarities of the shippers. It would seem, moreover, that a widespread international organization was at work, for the same characteristics are visible in thefts of merchandise from Italy, France, Spain, and England as from the United States.

"One house imported a lot of 30 automobiles. It is the custom of this factory to pack the set of tools in one special corner of the case. A hole was cut into this particular corner of 29 cases and the tool sets were removed. Apparently the thieves knew exactly where to look for the articles they desired.

"Another house which imports dry goods found that zinc lined cases had been opened, the silk contents

removed and an equal weight of coal put into the cases which were nailed up. Another house which also imports dry goods had several cases of silk velvet completely rifled and in the cases were found cotton goods of an inferior quality. Each of these cases involved losses amounting to nearly $10,000 gold. One exporter of silk from Europe, with the idea of deceiving the thieves, changed his form of packing and also his shipping marks, but the thieves went direct to the packages and rifled them as though they knew beforehand what they contained. Two separate shipments, each containing 150,000 sewing machine needles, were stolen, the empty boxes arriving in Buenos Aires, although in this instance the shippers have complete security that the merchandise was loaded on the steamer in proper condition in New York. A merchant makes his custom house declaration in harmony with the shipping documents received from abroad, and must pay duty on goods that are stolen.

"The British steamship companies at first, and more recently the American steamship companies, have included in their bills of lading a clause to the effect that the steamer will not be responsible for pilferage in all cases in which loss can be covered by insurance. Insurance companies are increasing their rates and threaten to make still more increases. The attitude of the steamship companies and the captains is a direct invitation to unrestricted theft on board ship. As theft increases, insurance rates will increase and the eventual prejudice to legitimate commerce threatens to be very grave.

"The opinion of responsible maritime insurance agents and adjusters, who are in close touch with the situation, is that the only remedy is for the steamship companies to reassume responsibility for pilferage, and in case they are unwilling to do so governmental pressure should be brought to bear to compel them to eliminate this clause."

Before taking up methods of pilfering and means of detection, it would be well to state that claims for pilferage frequently take weeks and sometimes months to settle, and the insurance companies should receive the closest cooperation from the shipper and consignee. These latter are particularly slow in reporting claims to carriers, but the need of prompt action and close cooperation cannot be too strongly emphasized.

How Pilfering Occurs.—It should not be supposed for a moment that because a case of goods reaches a foreign port with a portion of the contents lacking, that this means that a thief has been at work aboard ship or in the foreign port. Pilfering may occur at any point in the journey of the case; it may occur in the very factory manufacturing the goods, or it may occur at some later stage. It is therefore of the utmost importance, if pilferage is to be traced, that every effort be made to be sure that the merchandise leaves the factory in good shape. The writer knows of a shipment of typewriters in which several cases reached their destination without the goods. Laborious and painstaking investigation developed that when this shipment left the factory several of the cases were minus machines; instead of typewriters the cases contained scrap iron of the requisite weight.

This method of substitution is extremely common and may take place all along the line. Many instances are on record where goods have been stolen from their cases and the cases filled with stones, bricks, or scrap iron; the cases are then carefully resealed and delivered. Only recently an instance of this was called to the writer's attention. A truckman, employed in delivering goods to a pier in Hoboken, N. J., and later found to be a member of an organized gang, was caught red-handed when it was discovered that he was exchanging cases of high-grade textiles, en route to the pier, for other cases of the same weight and size and bearing the same marks, but containing nothing but waste material. The silk industry has been particularly hard hit by this method of substitution, and frequently it is extremely difficult to find out where the substitution is taking place. Truck-

men may resort to other methods. The receiving stamp of the freight clerk may be stolen and the bill of lading stamped, the goods being sold and the stamped bill of lading delivered to the shipper. A box of stolen merchandise may be substituted for an empty case, and so on. A short time ago in removing cargo from a British vessel several cases of linens were found to have been tampered with. The linens were subsequently found in the berths of thirty-three members of the crew.

The variety of methods used is limited only by the ingenuity of the thief. Aboard ship, or anywhere en route, a very common method is to loosen the nails or straps on a case, slip out a board, and abstract as much of the goods as possible, the board then being replaced. With this method it is not possible, unless the case is sealed, to tell that it has been tampered with until opened in the custom house.

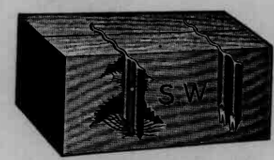
Courtesy of The Stanley Works.

Figure 1

How to Minimize Pilferage.—It will be noted that I have not headed this paragraph "How to Prevent Pilfering," for the reason that I do not believe any absolute remedy exists. But I do believe that it is possible to minimize it, and I will attempt to describe as fully as possible the most approved methods in use for checkmating the thief. It is not possible to absolutely prevent pilferage because pilferage takes place when goods are packed in tin-lined, hermetically sealed cases, and there is no safety device, so far as the writer knows, that provides the all-around protection which would be required. Indeed to prevent pilfering the only sure method would be to ship goods in burglar-proof steel cases. The writer believes that all that can be done to prevent loss of this

character is to adopt certain precautions that will lead to the detection of the theft, or deter the thief from tampering with the case. In the great majority of shipments this is all that need be done, and is absolutely effective.

Pilferage may be minimized by the manner in which the contents of the case are arranged. For example, the writer has known houses that shipped shoes with all the right shoes in one case and the left shoes in another. Another house has shipped the bowls of coffee-grinders in one case and the gears in another, while the same house packs the breach mechanism of rifles and revolvers in a case separate from that in which the stocks are sent out. In the case of cutlery the writer has known of the sets being broken up in the packing, the knives separate from the forks, and so on.



Courtesy of The Stanley Works.

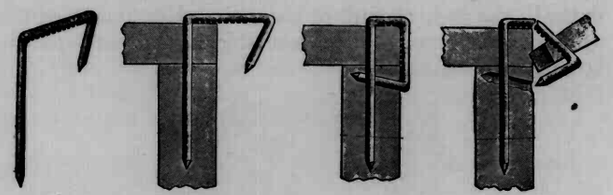
Figure 2

In those shipments where the case is put together with screws, these latter may be countersunk and the holes filled with wax. Tampering with the case can be immediately detected. Another method is to drill small holes in each of the boards on the sides, top and bottom of a box, pass a cord through these holes and seal the ends of the cord with a lead seal. A board cannot be removed without cutting the cord. This method, however, weakens the box by drilling holes in the boards, and the holes also admit moisture.

Foreign customers of a large New York house specializing in automobile accessories advise that a very good method for preventing pilfering in their particular instance is the practice of strapping the case inside. The walls, bottom and cover should be so strapped, not

necessarily by a continuous band, that it is impossible for a would-be pilferer to remove or slide out one board and replace it without detection. A whole side of the case has to be destroyed in order to remove a single board.

In shipping hats, a large American manufacturer states that when his goods are forwarded by steamer to Mexico, where the risk of theft is very great, a double wooden case is employed, that is, one case inside of another, the boards of the inside case running in opposite directions from the boards of the outside case.



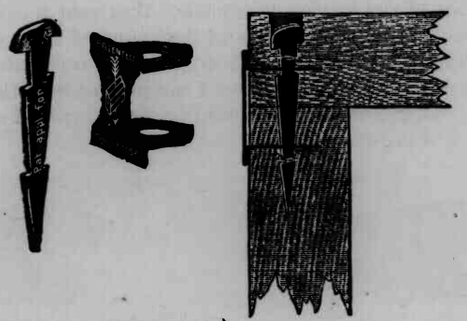
Courtesy of E. J. Brooks & Co.

Figure 3

Steel strapping, properly tightened and securely nailed, will do much to make it difficult for a thief to enter a case, but one of the best methods is perhaps the simplest. This consists in leaving the outside of the case free of any marks or plasters that would call attention to the character of the contents. Candy and shoes are two products that suffer a great deal from pilfering, and in these shipments the picture of a shoe or of a box of candy on the case is without question the delight of the thief. It might be stated here that shipments of boots and shoes, wines, liquors and so on, will not be accepted by the steamship companies for transportation unless the cases are protected by metal straps, wires secured by lead seals or some other equally efficient device.

It is frequently a wise precaution to alter shipping marks from time to time. A consignee, for example, who

is a regular importer of shoes becomes known by his marks, and changing of the mark occasionally will often lead the thief astray. Another very simple way to reduce pilfering losses to a minimum is to see that good cases are used and that these cases are properly constructed and properly nailed. A favorite diversion is to drop a package, and in case it is defective the goods are scattered over the dock. Obviously an excellent opportunity is given for stealing a certain portion of the contents.



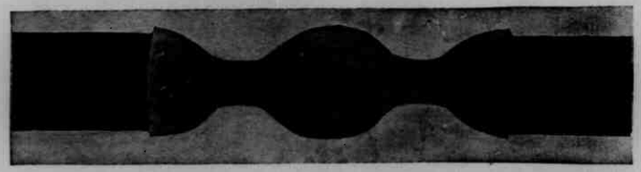
Courtesy of The Durabla Manufacturing Co.

Figure 4

The "Foul" Bill of Lading.—The liability of the ocean carrier is much more limited than that of the railroad, but none the less there is a margin of liability and the ocean carrier is extremely careful to inspect all freight received. A bill of lading with "insufficiently packed" or similar quotations is known as a "foul" bill of lading, as contrasted with a "clean" bill, which indicates that the packages have been received in good order. It should be the duty of the shipper or his agent to see that goods delivered in bad shape to the dock are properly conditioned before the sailing of the ship, or that they are omitted from the shipment, for a "foul" bill is going to give trouble at the bank, and if a claim is made

against the carrier there is going to be great difficulty in getting that claim satisfied, if it is ever satisfied. Here we have another urgent argument for good packing, for obviously a shipper is going to meet a stone wall when he tries to recover for pilfering on the basis of a "foul" bill of lading.

Sealing Devices.—In the foregoing pages we have summarized the results of practice with reference to pilfering, and we have also mentioned one or two methods of sealing. There are in addition to the methods stated a number of devices on the market that seal a case very satisfactorily, but let us repeat that none of these devices will physically prevent pilfering. The only object of sealing a case is to make patent tampering with the case. A seal is in the nature of a red flag that is raised as soon as the seal is broken.



Courtesy of The Signode System, Inc.

Figure 5

A large exporter of textiles in a letter containing packing instructions recently sent to mills, comments on the frequent pilfering of cases in which the boards are not joined by tongue and groove. The pilfering in this instance is usually accomplished by drawing the nails which pass through the metal bands at both ends of the top, side, or bottom and slipping one board forward sufficiently to gain entry to the case.

In order to prevent this form of loss the firm in question recommends the use of the device illustrated in Figure 1. This device, which consists of a pronged metal strip, is nailed on the inside of the case where the boards join, and is said to prevent the removal of a single board.

In the letter of instruction the firm points out that a single board may be slipped out from the sides, or even the bottom of a case with almost as much ease as from the top, and that the use of the device for the protection of the cover alone is not adequate protection for the case. For this reason they advocate the use of the device on both sides and bottom as a further guarantee of security.

Another device employed for the same purpose and consisting of a saw-edge corrugated piece of steel, is illustrated by Figure 2. This device, which is driven into adjoining boards, preventing the removal of one board without severe mutilation of the next adjoining, is used by an international house exporting silverware and has likewise been generally used by European exporters of wines. The exporters of silverware who use it further protect their cases by sealing and strapping them with four or five metal bands which make it impossible to open a case without leaving evidence of pilferage.

Another device which has proved satisfactory is a safety nail. This nail, as well as the method of using it, is illustrated by Figure 3. The top of the nail is notched underneath and after being driven into the case it is impossible to remove it without breaking. This is shown in the fourth cut of the illustration, where the nail is being broken with the point of a screwdriver. It is reported that this nail was tried out at the Forest Products Laboratory, Madison, Wisconsin, and that it was found very efficient.

A fourth device is a safety clip or seal, and is illustrated by Figure 4. The clip is driven across the outside joints of the box, and the spear-shaped nail is driven from the top and passes through the hole in the staple. The case is effectually sealed. The writer has seen this clip demonstrated and it is impossible, after applying the clip, to open the case without disfiguring it badly.

As will be seen, not all of the devices mentioned above are seals in the strict sense of the word, that is, that breaking them will show that the case has been tampered

with, but none the less they all serve the purpose of minimizing pilfering. Also it should be remembered that none of these devices are designed to take the place of metal straps.

In the chapter on paper, mention has been made of another seal. This is a metal sleeve, illustrated in Figure 5, which is slipped over the two ends of a metal strap and produces a joint that is as strong as the strap itself. This seal can be used without nailing the strap, and is well adapted to light boxes, bales and bundles the character of which does not admit of nailing. The seal is attached with a special implement, while another tool is used to tighten the strap. Where the case is heavy enough to stand nailing, we would recommend that the strap be nailed, for the seal would thereby lose none of its effectiveness.

CHAPTER X

CUSTOMS REGULATIONS AS AFFECTING PACKING

WE now come to a consideration of customs requirements in foreign countries which may sometimes have an important bearing on the kinds of export packages which should be used. This is especially true in shipping to certain Latin American countries, but it seems probable that a few peculiar conditions in this regard have led to an exaggerated idea of the importance of the whole subject. It is the rare and exceptional case that any attention whatsoever is called for or is given by shippers, so far as special packing to meet custom house regulations is concerned, when shipments are made to countries of Europe, Asia, Africa or Oceania. Neither complaints nor special instructions from importers in any markets of these parts of the world are common. On the other hand, the weights of containers and the problem of packing several different kinds of goods in one box, are important considerations in shipping to some Latin American markets. Yet even in these markets importers on a large scale, those most familiar with overseas business, almost always give specific and detailed instructions when they place their orders. When such instructions are thus given, they must be adhered to with the most punctilious care. If it happens that an order is received from a Latin American market without special instructions, then sometimes the American shipper has time to write back to his customer and inquire for any specific instructions as to packing, before the goods themselves are ready for dispatch. In the contrary case, it is well for the shipper to study the custom house regulations of the country to which the goods are destined.

How Customs Methods Vary.—It must never be assumed, as seems sometimes to be the case, that methods and systems of assessing customs duties in other countries are the same as those of the United States. By way of illustration it may be pointed out very briefly that while most of our American import duties are ad valorem yet in many countries of the world, perhaps in most, import duties are specific, that is to say, on the weight or measurement of the goods as specified in the tariff. Then it is to be observed that some countries of the world, notably some Latin American republics, pay no attention at all to the invoice value of goods but their tariffs fix an official valuation for merchandise as it is officially described, and duties are assessed on the official valuation. Again, not a few countries of the world in their tariffs fix a definite stated tare allowance, no matter what the actual tare of the box, case, barrel or other container may be. More important, however, is the fact that customs duties are frequently assessed on the gross weight of goods, that is to say, on the weight of the case itself as well as the weight of the merchandise contained therein. In such instances it is obvious that export packages which are sufficiently strong to meet all the hazards of overseas shipment and local foreign conditions, and at the same time are of lighter weight than other packages which might be supplied, will be favored by the importer. His total cost is less for the goods contained in the lighter package, and the exporter who has studied the subject and devised the lighter package will be favored with continued orders as against the exporter who ships his goods in unnecessarily heavy packages involving higher customs duties.

Special Packing for Interior Transportation.—It is in some of the Latin-American countries particularly that special packing to meet crude systems of interior transportation, or lack of any modern transportation facilities, makes necessary careful attention to the size and even the shape of export packages. This, too, is a problem which is, perhaps, much too frequently emphasized.

Shippers to Turkey or to China are seldom called upon to make their packages, or at least their outside containers, of any special size or weight, even though interior transportation systems in those countries are crude and goods have to be transported to otherwise inaccessible regions on camel-back or by coolies. It is the custom in those countries, and in many other countries of the world where conditions are primitive, for large importers in the principal ports of entry to receive their goods in bulk form and repack them as may be necessary (often in assorted miscellaneous packages) to reach their destination in the interior safely and satisfactorily. In some Latin-American markets, however, there has developed the desire on the part of a good many merchants at interior points (only accessible by pack train or by crude ox-carts, by complicated systems of transfers from railway to river boat, or, at times, to canoes, with further transfers by burro) to place direct import orders with original manufacturers; and possibly less of the trade of such markets is handled by large importing houses at the principal port cities, with the result that there are insistent demands from these markets for special packing to meet these local conditions. In these, as in all cases of instructions given by customers, shippers must adhere strictly to the instructions which they receive. In shipments to many parts of the world no particular consideration, apart from specific instructions received from customers, is called for on the part of the shipper, with reference to size and weight of containers, except as those features are governed and dictated by general principles applying to all overseas packages. In the case of shipments to some Latin-American countries, however, the shipper must not only adhere to explicit instructions given him by his customer in those markets, but may even be expected to exercise his own intelligence by studying local conditions in the market to which a shipment is destined and adapting his packing to those conditions.

More Study Required.—In a previous chapter some

illustrations have been given of climatic conditions and unloading facilities at foreign ports, as affecting the kind of export packages in which the shipper should dispatch his goods. These are matters about which customers rarely give specific instructions. Every shipper is supposed to know something about geography and everyone engaged in the export business must at least have a good map of the world before him. He must know where different countries are located, in what instances shipments for given countries have to cross the equator or pass through hot, damp stretches of sea water, the Red Sea for example, preparing his export shipment accordingly. Every man engaged in the export business must understand that even as in New York and other American ports, so also in the best equipped foreign ports, steamers sometimes tie up alongside of piers or quays onto which their cargo is immediately discharged, sometimes into weather-proof warehouse, sometimes not; while in other cases, in the same ports, it is necessary that steamers anchor in the stream and discharge their cargo into lighters, which in turn have to be discharged on shore, necessitating double or treble handling. These are matters of elementary education. The data which follows, alphabetically arranged under the different countries of the world, are designed to give merely hints or reminders of generally prevailing local conditions of climate, port facilities and the principles on which customs duties are assessed.

Good strong packing has constantly been insisted upon in this book and I do not wish to suggest any departure from this rule, but it is highly desirable that the exporter carefully study the requirements of the country of destination when he is making up his export packages in order, if possible, to effect substantial savings for his foreign customers. Those savings will eventuate in increased orders, the result of the service rendered by the exporter. The rule of good strong packing may therefore be modified to read: "The exporter should in every instance consider carefully the nature of the goods and the

method used for levying duty." In every shipping or traffic department there should be at hand reliable data on this subject, so that every effort may be made to protect the interests of the customer at the other end. It must be remembered that a little carelessness on the part of the shipper may mean a large and absolutely unnecessary loss to the consignee.

Principles Involved in Foreign Tariffs.—Before the war there were two broad principles laid down in reference to duties on importations into countries of Continental Europe. Goods that paid duty above a certain rate were assessed on actual or legal net weight, while merchandise that paid a lower rate was assessed on gross weight. The fairness of this is obvious, for it would be manifestly unjust to levy a high rate of duty on the packing boxes containing fine goods, paying a high rate, while in the case of ordinary goods, paying a very low rate, the levy on the packing itself did not amount to an important item. What the situation will be when European tariff policies have been again determined it is impossible at present to predict.

In Latin American countries, however, there is no such well established rule, for there are as many different principles under which duty is assessed as there are goods, and the rulings are different in different countries. But even in those countries where there are certain uniform principles at work, there is only one way to obtain an idea of packing requirements and only one way to solve the difficulties, and that is by study of each individual instance, when buyers have not given specific instructions, as they may reasonably be expected and asked to do. In the summary which is given later of custom rulings in different countries, great divergence is evident and it will be seen that further study will facilitate progress toward landing goods in the manner most economical and profitable to the importer.

The Different Weights.—Before taking up the discussion of different countries, however, certain general statements should be made. It will be seen that there is con-

stant mention made of "net weight," "legal weight" and "gross weight." With reference to the gross weight there does not seem to be any great difficulty, but definitions of "legal" and "net" weights are different in many countries and they are different for different classes of goods. It has been stated that "by actual net weight is meant the weight of the merchandise alone, without any packing; by legal net weight is understood the gross weight less a certain percentage for tare." However, from the examples given it will be seen that this is entirely too general a definition.

Minimum Duty the Ideal.—In this question of customs duties it is not only a matter, especially in shipping to Latin America, of reducing the weight of a package as far as limits of safety permit, it is also a question of so packing goods with reference to the class of goods in the package that a minimum of duty will be paid. In a great many instances the instructions with the order will give the necessary directions, but unfortunately these instructions are not always followed and this inevitably means loss to the importer. In this connection let us take as an illustration the hypothetical example of a Chicago manufacturer who is told to forward certain goods to, let us say, Siberia, in two crates of 300 pounds each, metal parts in one case and wooden parts in another. Thinking that he is greatly helping his customer he ships all of the goods in one case weighing 600 pounds, later learning that more than 300 pounds can not be carted over the rough roads of Siberia; that there is a relatively high duty on metal goods and a relatively low one on wooden goods, and that when both kinds are packed together the higher rate is assessed on the whole package; and also that the customs house allows a certain weight for tare which would not have been exceeded by either one of the two crates, but which was exceeded by the case weighing 600 pounds.

Another Bad Example.—Again we have an instance of goods shipped to a Central American country where the packing material used was extremely heavy,

although the duties were levied on gross weight. In this instance it would have been quite possible to make the packages lighter. Side by side with this shipment there were crates of vegetables, which are not dutiable, and in this instance the crates were made of the lightest material; many of them had broken en route and the importer had lost heavily on the shipment. There was loss here in each instance, loss which was considerable and which could easily have been prevented had due care been taken by the shipper. A little study of the laws of this Central American state would have led to reducing the weight of the packages of one class of goods and increasing that of the other.

Customs Regulations.—The regulations given here are merely general, and although they have been brought up to date as far as possible, many of them will be substantially modified in the future by new international agreements and new trade conditions. It will be necessary, therefore, to study the customs rulings of each country, and this is advisable in any case, for customs rulings even under normal conditions are subject to constant modifications which the exporter ought to know. Obviously it would be impossible in a book of this character to give tariff schedules in full, and all we have attempted is to mirror, as it were, the diversity and variety of tariff and customs requirements and specifications.

Only by constantly seeking information can the exporter keep in touch with what is going on in this regard, and the matter published in this chapter is in no sense designed to save this labor. Each shipment ought always be handled in a more or less individual manner, and the documents relating to each consignment must have special attention and consideration.

Consuls of all foreign countries are located in many of the larger cities throughout the United States. Their addresses may be obtained from the State Department. The latest information in reference to customs and packing requirements may always be obtained at the consulates of the countries to which shipments are destined.

Abyssinia.—This country is situated close to the equator and shipments to it ordinarily pass through the torrid Red Sea. Packing should be of the most thorough character to withstand all hazards of heat, humidity, rough handling, and exposure, since goods destined to Abyssinia usually experience more than one transhipment en route.

Theoretically, the customs duties on imported merchandise are 10 per cent ad valorem. Goods are landed by lighter at the port of Djibouti, French Somaliland, and there is railroad transportation to Dire-Dawa. Away from the railroad, transportation is chiefly carried on by means of mules and camels. A mule can carry a load of 180 pounds and a camel one of 450 pounds in this country. Packages should therefore weigh accordingly, and consideration should be given to the fact that one-half the load is normally placed on each side of the pack saddle.

Albania.—Packing should be able to withstand all forms of transportation and climatic hazards. At least one transhipment is involved while en route. There are no railroads and few roads of any kind in the country. The climate is temperate. In view of the prevailing conditions at the present time the consular regulations and those of the steamship companies should be investigated and followed.

Algeria.—The climate of Algeria is subtropical. The provisions of the French tariff apply, with few exceptions, as do French consular regulations. Goods should be packed to withstand discharge into lighters and all other transportation hazards. There is direct steamship connection with some ports; for others transhipping is necessary. The regulations of the steamship companies should be investigated. Consuls of France may be asked for information as to conditions in this French colony.

Arabia.—This political division was formerly under Turkish rule but is now being divided into a number of new states. The climate is tropical. Shipments to Arabia should have the strongest possible packing and should be designed to resist all hazards. Steamers pass through the Red Sea with its intense heat and transhipments are usual. Marks and other details should be investigated in each individual case, as it is impossible at present to give any reliable facts. As in the case of certain countries in Africa the steamship companies have a number of packing requirements that must be observed.

There are practically no railroads or wagon roads in this part of the world, and everything is transported on the backs of men, mules, asses, or camels. A camel in Arabia is reported to carry a load of between 350 and 390 pounds, a mule about 250 pounds, a donkey 150 pounds.

Argentina.—Climatic conditions in Argentina closely approximate those of our South Atlantic States, but shipments destined to Argentina must pass through the tropics on their voyage. At Buenos Aires, Bahia Blanca, Rosario, and La Plata boats may discharge at docks and quays, but transhipping is frequently necessary. Interior transportation in Argentina is on the whole very satisfactory.

Duties on the majority of articles specified in the Argentine tariff are levied on the basis of legal weight, in other words, on the gross weight with various reductions for tare based upon the nature of the packing. Since, if different classes of merchandise are packed in one case or package, the customs authorities may assess duty on the whole package at the rate to which the highest taxed article included is subject, this practice is best avoided.

Many classes of goods imported into Argentina are dutiable on the weight of the goods and the individual container, and frequently an effort is made to reduce this duty by shipping goods in bulk in a single container.

Articles subject to duty on the basis of the weight of the goods and immediate container, if imported in a single container without individual wrapping are dutiable by net weight with a ten per cent surcharge.

Packages should bear shipping mark of consignee, the number of package, and name of steamer carrying goods. Packages may be marked with a brush or stencil, but the stencil has always been preferred, and marking should appear on two adjacent sides of the package. The Argentine authorities request that packages be protected with special care against pilfering.

The customs requirements in reference to canned goods of both animal and vegetable origin are most exacting and detailed, and include certain provisions with regard to certificates of health, labelling, and composition of containers which should be investigated by exporters of these products. Similar regulations likewise apply to shipments of plants and seeds. Information as to these regulations may be obtained upon application to the consul general of Argentina in New York City.

Australia.—Packing for Australia must be strong and designed to withstand severe handling. Especially must pilfering be guarded against, as complaints are frequent on this score. The climate ranges from sub-tropical in the south to tropical in the north. The voyage from the United States is through hot equatorial waters. Port conditions are in general good and vessels discharge at the wharves at Melbourne, Sydney, Adelaide, Brisbane, and Fremantle. Railroad communications are satisfactory in the eastern portion of Australia, but are not extensive in western Australia. However, more freight, except for way points, is carried by coasting vessels, requiring transhipment sometimes more than once. The gauges of the several different States of the Commonwealth vary, requiring unloading and loading again as the State boundaries are crossed. Special packing for this condition, as for cart, or (in northern West Australia) camel transportation to reach remote interior sections, is always cared for by the large importers in the chief ports and requires no special attention from American shippers, except when specific instructions have been given.

Duties are assessed ad valorem and the value of the

goods is f. o. b. value at port of shipment plus ten per cent. First is taken the value of the article at the net price that would be paid for the goods by a cash customer at home. To this is added inland cartage and freight charges, plus lighterage charges and a number of other charges. On the contrary, a number of items, such as outside packing, dock fees and others, are not included in the dutiable value. Strictly speaking, however, these points are for the man who makes out the invoices, and the one in charge of the packing should only see that his packing is sufficient for the trip, and that it is as economical as the situation warrants.

Certain shipping lines have their own regulations, as, for example, the limiting of shipments packed in bags or sacks to a maximum gross weight of 200 pounds, the marking of gross weight, in pounds, on packages and the requirement that cases destined beyond direct ports be iron-strapped. These regulations should be carefully investigated.

Restrictions on importations of cigarettes, tobacco and cigars are stringent and should be carefully investigated before packing. This also applies to importations of alcoholic liquids and drugs.

The Trade Descriptions Act of 1905 demands most careful study. It provides that a carefully defined trade description must be applied to certain classes of goods in the form of a label or brand; and is strictly enforced with respect to such commodities as shoes, socks, articles of food and drink, medicines and pharmaceutical preparations, apparel, jewelry, fertilizers, seeds, and plants.

The principal provisions of the act are to the effect that (1) the importation or introduction into Australia of any specified goods unless there is applied to them a trade description of such character, relating to such matters and applied in such manner as is prescribed, may be prohibited. (2) No person shall import any goods to which a false trade description is applied. These regulations shall not prescribe a trade description which discloses trade secrets of manufacture or preparation, un-

less in the opinion of the Governor-General the disclosure is necessary for the protection of the health or welfare of the public. Moreover, it is specifically provided that outside packages need not be marked at all unless they are the sole containers of goods to which it is impracticable to apply the trade description.

The goods to which the provisions of the act apply are:

"(a) Articles used for food or drink by man, or used in the manufacture or preparation of articles used for food or drink by man; or

"(b) Medicines or medicinal preparations for internal or external use; or

"(c) Manures; or

"(d) Apparel (including boots and shoes) and the materials from which such apparel is manufactured; or

"(e) Jewelry; or

"(f) Seeds and plants."

The trade description to be applied shall comply with the following provisions:

"(a) It shall be in the form of a principal label or brand affixed in a prominent position and in as permanent a manner as practicable to the goods, or where affixture to the goods is impracticable, to the coverings containing the goods; and

"(b) It shall contain in prominent and legible characters a true description of the goods, and the name of the country or place in which the goods were made or produced; and

"(c) In cases where any weight or quantity is set out, it shall specify whether the weight or quantity so set out is gross or net.

"In the case of the following goods, the trade description shall in addition, comply with the following provisions:

"In the case of articles of apparel, the trade description shall state the nature of the principal material of which the articles are made, and shall, wherever practicable, be applied by means of indelible stamping.

"Where articles of apparel are manufactured of fibrous material containing not more than 10 per cent of fibre other than the preponderating fibre, the name of the preponderating fibre, (e. g., 'Wool') may be used to indicate the nature of the material. In other cases the trade description shall set out the names of the principal fibres present in the material, or, alternatively, describe the material as being made of the preponderating fibre 'and Other Fibres' (e. g., 'Wool and Other Fibres').

"In the case of piece goods intended for or commonly used in the manufacture of articles of apparel, the trade description shall specify the names of the principal fibres of which the material is composed.

"Where the material does not contain more than 10 per cent of fibre other than the preponderating fibre, the name of the preponderating fibre may be used in the trade description to indicate the nature of the material. In other cases the trade description shall set out the names of the principal fibres present in the material, or, alternatively, describe the material as being made of the preponderating fibre 'and Other Fibres' (e. g., 'Wool and Other Fibres'). In cases where any substance (other than ordinary dressing) has been used in the preparation or manufacture which has the effect of loading or weighting the material, the word 'Loaded' or 'Weighted' shall also be included in the trade description.

"In the case of boots and shoes manufactured wholly or partly from leather or any imitation thereof, the trade description shall set out the principal material from which they have been made, and unless the soles are solid leather, without admixture or addition other than ordinary fillers of cork or of waterproofed felt, shall state the nature of the admixture or addition, and a statement of the material or materials composing the sole shall, in addition, be conspicuously, legibly, and indelibly stamped upon or impressed into the outer surface of the sole of each boot or shoe.

"In the case of leather containing any loading of any mineral or other weighting substance, the trade descrip-

tion shall include a statement setting out the name of each loading substance contained in the leather, and the percentage thereof. Provided that the following shall not be deemed to be loading substances within the meaning of this Regulation: Glucose and sugar to the extent of not more than 3 per cent taken together, and fats and oils used in the manufacture and preparation of the leather.

"In the case of gold jewelry the carat quality shall be conspicuously set out in the trade description applied to the goods, and shall also, where practicable, be legibly stamped or engraved upon each article.

"In the case of jewelry wholly or partly covered by gold, the words 'Rolled Gold,' 'Gold Cased,' 'Gold Plated,' or 'Gilt,' as the case requires, shall be conspicuously set out in the trade description applied to the goods, and shall also, where practicable, be legibly stamped upon each article.

"In the case of silver jewelry not marked with a British hall-mark, the degree of millesimal fineness (*e.g.*, '.925 fine') shall be conspicuously set out in the trade description applied to the goods, and the number indicating such degree of millesimal fineness shall also, where practicable, be legibly stamped or engraved upon each article."

"In the case of jewelry which, not being gold or silver, nor coated with gold or silver, is colored to represent gold or silver or gold and silver, the words 'Imitation Jewelry' shall be conspicuously set out in the trade description applied to the goods, and the word 'Imitation' shall also, where practicable, be legibly stamped upon each article."

The detailed provisions of the act with respect to apparel, including boots and shoes, the material from which apparel is manufactured, and jewelry, are set forth in a twenty-five page pamphlet which may be procured by manufacturers of the commodities affected from the representative of the Department of Trade and Customs of the Commonwealth of Australia in New York City.

Austria.—Climatic conditions in Austria are similar to those of the eastern Atlantic States, and under normal conditions railroad transportation is excellent. Under the terms of the Peace Treaty, Austria is a completely landlocked country and goods destined to Austria are normally shipped via German, Dutch, Italian and other European ports. The conditions applying to these countries respectively will, in general, therefore, apply to shipments to Austria.

No unusual packing is called for, apart from adequate overseas protection. Owing to the uncertain political conditions at present reigning in Austria, information with respect to the permanent tariff of that country is lacking. Under the former Austro-Hungarian tariff goods dutiable at the rate of 7.50 crowns or less per 100 kilos for which no tare allowance was specified by the tariff, were dutiable on the basis of gross weight. Duties on goods which were subject to a higher rate of duty than the above were assessed on the basis of net weight, which in this instance was equivalent to gross weight with deduction of tare allowance according to the tare schedule annexed to the tariff. In the case of liquids the dutiable weight included that of the immediate container.

Bahama Islands.—The climate of the Bahama Islands is tropical. The islands are reached at frequent intervals by direct steamer from New York. Goods are ordinarily transferred by lighters. There are no official restrictions with respect to shipping marks or weights. The Bahama Islands are a British colony and information about local conditions may be obtained from British Consular officials.

Belgium.—The climate of Belgium is similar to that of New York. There are frequent and good direct sailings. At the ports of Antwerp and Ghent the vessels discharge at the docks or quays, with improved modern facilities. Transportation by railway and canal is similar to our own. There are no official restrictions as to marks or weights, but several of the shipping companies stipulate that gross weights in pounds must be marked on

packages. Goods imported into Belgium are dutiable on actual or net weight and ad valorum. A new tariff went into effect June 12, 1920.

Bermuda.—Climate is subtropical. There are direct steamers from New York. There are no official restrictions with respect to marks or weights. British consuls may be asked for information regarding this colony.

Bolivia.—Shipments to Bolivia should be most carefully protected against damage by the elements and also against the perils of rough handling. The instructions of the customer should be most carefully followed. The goods are exposed to the hardships of several transhipments by lighters, rail and river boats, and the interior means of transportation are most primitive.

Bolivia lies wholly within the tropics, but the temperature at a given place depends entirely upon the altitude of its location. The climate of La Paz and Potosí, the two principal cities which are respectively 12,000 and 13,600 feet above sea level, is normally temperate. Bolivia has a rainy season lasting from December to May, and a dry season from May to December. In southeastern Bolivia the climate is subtropical.

Bolivia is entirely landlocked and all commerce with the outside world passes through the territory of its neighbors. The ports through which this commerce passes are Antofagasta and Arica, in Chile, and Mollendo, in Perú, on the Pacific; Buenos Aires, for transport by the Argentine railway route to the southern parts of Bolivia; and Pará, on the Brazilian Amazon, for the very limited commerce of the extreme northeast. Of the six cities of Bolivia with a population of 20,000 or more, only La Paz and Oruro can be reached by rail. The transfer of freight throughout the interior of Bolivia is by means of donkeys, llamas, mules and Indians. Reports from Bolivia state that a llama can carry a bale of not over 100 pounds, a donkey can carry two 100 pound bales, one on each side, while a mule can carry two 125 pound bales, one on each side.

Articles on which duty is assessed may be dutiable

either on net weight, gross weight, or on the weight of the merchandise, together with that of the immediate packing, such as a cardboard box or paper. The term "immediate packing" does not include wooden or tin boxes, or any material serving as a covering for the outside containers. Mixed packing is not subject to penalty unless it is employed as a method of defrauding the customs.

Marks and numbers and net and gross weights should appear on all packages. Special care should be taken also to mark on each package in large letters, "En tránsito a Bolivia" (In transit to Bolivia). This method has been adopted for the purpose of expediting the landing of freight and its separation and entry in the respective warehouses; and also to prevent customs duties being collected twice on the same goods. Packages sent by way of Chile must be marked with a stencil, while those sent through other countries may be marked either with a stencil or brush.

Brazil.—Goods destined to Brazil should be packed with due allowance for rough handling to which they may be subject. At the ports of Rio de Janeiro, Santos, Pará, Rio Grande do Sul and Pernambuco, steamers may dock at quays, but at many other ports along the entire coast goods must be discharged into lighters, often in open roadsteads. Some of the principal ports are reached by direct steamers, others only by transhipment. The tropical climate of Brazil must also be taken into consideration and goods packed accordingly, above all for the Amazon ports. Interior transportation in Brazil is to a large extent fluvial, since railroad transportation, excepting in the southern portions of the country, is not extensive, and overland transportation is carried on by mules, carts, and other methods, even (in the remote Amazon country) by canoes.

Under the Brazilian tariff, articles which are dutiable by weight are specifically subject to duties either on the basis of gross weight, legal net weight, or actual net weight. Gross weight is that of the goods and packing

together, with the exception of rough wooden containers. Legal net weight is equivalent to gross weight less the different tare allowances specified in the tariff for various kinds of merchandise and containers. Actual net weight is the weight of the merchandise without any packing. If goods dutiable on legal net weight and actual net weight are imported in the same package the duty on both is assessed on the basis of actual net weight. When goods dutiable on net weight but subject to different tare allowances are imported in the same package, duty is assessed on the basis of actual net weight. When goods subject to different rates of duty, all being subject to duty on the basis of gross weight, are imported in the same package, the weight of the packing is proportionately distributed among the various kinds of merchandise which the package contains. In this instance some study of the Brazilian tariff will repay the exporter. In every instance the Brazilian importer should clearly specify the packing procedure which he wishes followed.

Packages may be marked with brush or stencil, but the practice of separating or breaking up shipments for clearing is not permitted. Goods for different consignees should not be placed in the same case, as duty will have to be paid on all the goods before they can be cleared. The general rule of good packing practice, that the side of the case where mark and number appear should be free from other marks or instructions, is insisted on by the Brazilian authorities, although the weights need not be marked on the packages.

The first necessity in packing goods for Brazil is that goods should be so cased and so protected within the cases that they can be safely dropped a considerable distance. Goods should be protected against dampness, against heat, in case they are stored near boilers, against the use of hooks, and so far as possible against exposure to rain and sea water.

In portions of Brazil, particularly the Amazon River district, the cases, nails and straps used for packing goods have considerable value. Boxes are carefully preserved and barrels of all kinds are worth more than their original cost. To be sure this only applies to good cases and good barrels, and if the exporter wishes to add an important element to the popularity of his goods in this part of the world, he will see to it that his packing materials are first class.

As in the case of the Argentine, the Brazilian authorities are most exacting in the matter of labeling goods. Manufacturers of pharmaceutical preparations and foodstuffs should consult the regulations applying to these commodities which may be procured at the Brazilian consulate.

British East Africa.—Packing should be sufficiently strong to withstand tropical heat and all hazards of transportation. There are no official restrictions as to marks or weights, but the requirements of the steamship companies should be investigated and followed. Cargo at Mombasa is discharged into lighters. British East Africa is usually reached from the United States by transhipping en route. Information with respect to this colony may be obtained from British consular officials.

British Guiana.—Shipments to British Guiana must be prepared to meet every hazard of transportation and tropical climate. Practically, there are no railways and transportation must be done by rivers, man, or beast. Steamers ply directly from New York to Georgetown. There are no restrictions as to marks, although the different steamship companies have certain requirements of their own. These should be obtained from the companies themselves. Special information may be sought from British consuls.

British Honduras.—Landing of cargo is by lighters, but steamers from several American ports run directly to Belize. The general remarks are the necessity of packing to resist all hazards made under the heading "Honduras" apply also to British Honduras. Some shipments for southern Mexico are routed via Belize and require special care in packing. The climate of British Honduras is tropical. There are no official restrictions

as to shipping marks, weights, etc. Further inquiries may be made of British consuls.

British Somaliland.—The duties assessed at Zeyla and all other ports are ad valorem with few exceptions. There are no official restrictions as to marks or weights, but the regulations of the steamship companies should be investigated. Packing should be of such a nature as to withstand extreme tropical climate and all hazards of crude landing and interior transportations, as well as transhipments en route. The interests of this colony are in the hands of British consuls.

British West Indies.—The British West Indies comprise the Bahama Islands, Barbados, Jamaica, the Leeward Islands, Trinidad and Tobago and the Windward Islands. Separate mention is made in this chapter of the Bahama Islands and Jamaica. The interests of these islands in the United States are in charge of British consular officials.

The principal island colonies of Great Britain in the Leeward group are St. Kitts, Antigua and Dominica, which have frequent steamship connections with New York and other American ports. The principal British islands of the Windward group are Grenada, St. Vincent, St. Lucia, and Barbados. Some of these islands are reached by direct steamers from New York. Trinidad, lying off the coast of Venezuela, and Tobago, lying between Trinidad and Grenada, are likewise reached by direct steamers.

The climate of these islands is subtropical. While certain ports are reached by direct steamers, others are served by transhipping to small coastal vessels, which involves the further risks of repeated handling. Again, although certain ports, such as Port Castries, St. Lucia, have good harbors and are notably safe, in others ships are anchored in the open roadstead. Packing should be able to withstand the hazards incident upon transfer by lighter from ship to land, and adequate waterproof protection should always be given in view of the frequency of exposure to rain. There are no official restrictions as

to marks and weights of packages, but certain steamship companies have their own regulations which should be investigated. No special packing is called for by custom house regulations.

Bulgaria.—The climate of Bulgaria is temperate. Steamers from New York sometimes call at Bulgarian ports. Landing of cargo is usually by lighter. Packing should be sufficiently strong to withstand interior transportation. Merchandise dutiable at the rate of 10 levs or less per 100 kilos is, with few exceptions, dutiable on the basis of gross weight. Duty is assessed on the basis of net weight on merchandise subject to higher rates of duty. In view of the prevailing conditions at the present time the consular regulations and those of the steamship companies should be investigated and followed.

Canary Islands.—Climate is tropical. As there are rarely direct sailings from New York, transhipments must usually be expected. Cargo is landed by lighters. Customs regulations given under Spain apply, and any special information should be sought from Spanish consuls.

Chile.—Goods are generally landed at Chilian ports by lighters, and both conditions and methods prevailing are severe. Antofagasta, especially, has the reputation of being one of the stormiest ports of the Pacific where lighterage is frequently interrupted by the violence of the sea. Goods should be most securely packed and protected against the elements. The climate may be described as temperate and interior transportation conditions are normal. Some direct steamers from the United States call at most of the large ports, others only at a few ports, requiring transhipment.

Merchandise subject to duty by weight may be dutiable on net weight, gross weight, weight including packing, or weight including containers. The following definitions and rules are taken from the general rules for the application of the customs tariff of November 25, 1907:

"3. By 'net weight' is understood the actual weight of the goods, without packing, receptacles, or wrappers.

"4. The term 'weight including packing' means the weight of the goods, together with all packing, receptacles, or cords contained in the outer container except the straw, shavings, paper, sawdust, or other material used for protecting the contents. This rule shall not apply to goods for which special rules are provided in the tariff.

"5. 'Weight including container' means the weight of the goods together with immediate receptacles, even if no other container were used for their transportation.

"6. 'Gross weight' means the weight of the goods together with all receptacles and packing. Goods usually transported without packing or in bundles, as rails, girders, etc., are included in this section.

"7. By 'ordinary receptacles' are to be understood earthenware or glass pots, bottles or flasks; iron, zinc, tin, copper, or lead drums, wooden cases, cardboard or tinplate boxes, and any other containers of indispensable use. Receptacles not usually employed for the goods they contain and having a separate value or use shall be considered as dutiable merchandise and appraised separately.

"8. When goods dutiable on 'weight including packing' are imported loose in bulk or bundles, or without packing within the outer container, the net weight shall be increased by 10 per cent. The same additional weight shall apply to the net weight when articles are imported in cases ('estuches')[1], unless otherwise expressly provided in the tariff.

"9. If goods subject to distinct rules as to weight, valuation, or duty are imported in the same package, they shall be weighed in the condition in which presented; and there shall be added 10 per cent in the case of goods dutiable on weight including packing, if imported without packing; 20 per cent in the case of goods dutiable on gross weight, if contained in a receptacle or packing; and 30 per cent if not so contained or packed. Glass, earthen, and china wares, furniture, enameled articles of wrought iron, paraffin lamps, and iron bedsteads are ex-

[1] This refers to instrument and similar cases, and not to packing cases.

cepted, and shall be liable to an increase of 80 per cent on their net weight.

"10. For the purpose of assessing duty according to gross weight on envelopes and writing paper imported together in the same package, the weight of the package shall be added proportionately to the net weight of the contents.

"11. If bottles of the kinds specified in tariff No. 974 are imported in special cases used for liquors, the second portion of above rule 7 shall apply, and, as stipulated, the gross weight of the packing is to be ascertained, and the outside packing case is to be weighed separately, the remaining weight being attributed to the bottles, whether in straw envelopes or not. In such case the package shall not be subject to the surtaxes established in rule 9.

"12. If imported iron bedsteads are not packed in cases or hampers, they shall be appraised according to net weight, in their corresponding class, with an additional 80 per cent.

"13. When artificial flowers and neckties are imported packed otherwise than in cardboard or wooden boxes, the net weight shall be increased by 100 per cent.

"14. Cases[1] for jewelry, watches, and gold, silver, or platinum wares are included in the appraisement of such articles. Any extra cases are dutiable separately in their corresponding class.

If metal manufactures are imported in cases ('estuches'),[1] the latter shall be appraised separately in their corresponding class.

In marking packages for shipment a stencil should be used; the use of a brush is not permitted. Packages must show number, marks, gross weight in kilos with words "Gross Kilos" by the side of the numerals, and all marks must not be smaller than two and one-half inches in height unless size of package does not admit of markings of this height. A variation in weight of only one-half of one per cent is allowed.

[1] This refers to instrument and similar cases, and not to packing cases.

China.—There are no restrictions as to marking and packing and the problem with reference to China is not one dictated by government prescriptions, although the steamship companies have certain regulations which must be complied with. There are frequent sailings directly from United States ports to the principal ports of China. The packing problem is essentially one that is conditioned by climate and transportation. Cargo is ordinarily lightered from steamers to wharves, where it often lies for days exposed to the elements before being carried by coolies to warehouses, or "go-downs" as they are called. It must be remembered that China offers practically every form of meteorological condition, from the sixty degrees of frost in Manchuria to the malarial swamps of subtropical Yunnan. In the northern sections the winters are severe, the rivers are frozen for months and a large part of the coast line is ice-bound. In south China subtropical conditions prevail modified, however, to an important extent by varying degrees of altitude.

Interior transportation, the many transhipments and other hazards call for the most carefully considered packing, when especially requested by consignees. However, the great bulk of Chinese imports is received by the large distributors in the chief ports of entry and is by them repacked as interior demands and conditions make necessary. Practically all goods imported into China are at one time or another transported by coolie, pack mule, cart, wheelbarrow or donkey. The average load for one coolie is 100 pounds, transported in two packages of 50 pounds each, on the end of a bamboo pole; and where the load is carried by two coolies the weight can be 160 pounds, this likewise being transported on a long pole, each end carried by a coolie. Heavier loads require four or more coolies. Many of the small pack animals employed, particularly in the mountainous sections, cannot carry over one picul, 133 pounds.

Colombia.—Goods may be landed directly on the wharves of certain Colombian ports or they may be lightered from steamers which ply regularly from the

United States. However, goods shipped to Colombia must be most thoroughly protected against every possible hazard, as the conditions of interior transportation and those of the climate are most severe. The climate of the coast cities is tropical, but becomes temperate in the towns high up among the mountains. Colombia offers almost every conceivable difficulty from the standpoint of transportation, which may be effected by train, steamboat, mules, oxen and men, and frequently the packages will be exposed for hours to tropical rains, succeeded by intense heat. There is little, if any, modern freight handling equipment at terminals and hand labor is depended upon entirely. Packing for Colombia should be designed after the most thorough investigation and study of the conditions to which the shipment will be subjected, and the geographical location of city of destination.

Each package should be marked and numbered distinctly, and it is advisable to mark the weight on each package, though this is not required by law. The marking may be done with either stencil or brush.

Duty is levied on the basis of gross weight. If merchandise subject to different rates of duty is packed in the same container, the gross and net weight of each kind of merchandise must be separately indicated, or the entire package is subject to duty at the rate payable by the highest taxed article included in it.

Whereas different kinds of goods may be packed in one package this is not good practice, but when goods bearing different duty classifications are packed together the weight of the container or packing is divided proportionately in determininig duties. When a container is dutiable at a rate higher than the article contained therein, the container must be separately declared. On the contrary, when the container carries a lower duty than the contents the entire package bears the higher duty.

A recent British official publication states in part that "many important firms dealing with Colombia are of the opinion that packing is perhaps more important than

cheap prices. It is undoubtedly true that once a Colombian firm gets hold of a foreign firm that will take the trouble to follow out carefully packing instructions, it will continue to place orders although cheaper prices may be offered from another quarter. The Colombian customs tariffs are based on a fixed rate per article per kilo of gross weight. Owing to the inadequate internal communications of the country, any merchandise brought into the interior must undergo very severe handling and be subjected to many changes from railway to steamer, and from steamer to railway. It is therefore of the utmost importance that goods imported into Colombia should be packed in such a way that they will be able to withstand the very rough journey inland, and at the same time that the packing shall be sufficiently light to avoid excessive customs duties. Bales of goods, etc., should, if possible, not exceed 90 kilos, nor should they weigh less than 70 kilos." It should be noted, however, that the best practice prescribes packages weighing not more than 120 pounds (preferably, 110 pounds) and measuring not over 30 to 36 inches in length where muleback transportation is involved. Mule drivers always select the small and convenient packages for prompt despatch, leaving heavy pieces to wait sometimes for weeks.

A steamship service has been inaugurated to Buenaventura on the west coast of Colombia, thus eliminating transhipment at Panama. It should, however, be remembered that goods consigned inland from this port are carried in canoes or on mule pack and that packages must, therefore, be small and should not in any event exceed 85 kilos each net weight.

A special agent of the Bureau of Foreign and Domestic Commerce lists as follows the wanderings of merchandise from the coast to Bogotá. the capital of Colombia:

"It may be well to enumerate the necessary transfers of shipments on their way from the coast to Bogotá, as follows: From steamer at Puerto Colombia to train, which takes the merchandise to Barranquilla; at Barranquilla from train to custom-house; from custom-house to the boats of the lower Magdalena River; from the lower Magdalena River boats at La Dorado to train, which takes the goods to Beltran. At Beltran the merchandise is unloaded from the train to be put aboard the steamers of the upper Magdalena River, which proceed to Girardot, where the goods are unloaded and placed on train. This train proceeds as far as Facatativa, where transfer is made from the yard-gauge railroad to the meter-gauge railroad of the plateau, which finally lands the goods in Bogotá. All these conditions make careful packing indispensable. All goods and machinery should be packed in waterproofing because of the excessive humidity, the cases should be of medium size wherever possible, and full attention must be paid to Colombian customs regulations."

Costa Rica.—At Port Limon, on the Caribbean side, terminal facilities are good, while at Puntarenas, the port on the Pacific coast, cargo is taken off ships on lighters. There are direct steamship services from the United States to both ports. Packing should be able to withstand hard treatment. The climate at sea level is tropical, but in the high altitudes is temperate and agreeable. The rail connections between the principal cities are good.

Under the Costa Rican tariff duty is levied on the gross weight. If goods subject to different rates of duty are packed in the same container the net weight of each kind of merchandise should be indicated, so that each separate class of merchandise can bear a proportionate share of the weight of the packing. If this information is not furnished the entire package is subject to duty at the rate payable by the highest taxed article included in it.

Packages may be marked with either stencil or brush, and weights need not be shown on the packages.

Cuba.—At nearly every Cuban port goods are lightered ashore. Direct steamers from the United States carry freight to Havana, Santiago and some other ports of the island. The receiving of the goods on shore, while

not aided by modern dock methods, is still accomplished well and the storage is efficient in its protection. There is considerable coastwise traffic by small steamers and sailing vessels. Land transportation is in the main satisfactory, including modern railway systems. The climate is subtropical.

The Cuban tariff provides that articles are dutiable on either gross weight, actual net weight, legal net weight, or ad valorem, and the tariff indicates under which of these classes the duty on goods will be assessed. Legal net weight is determined in accordance with the schedule of tare allowances annexed to the tariff. In the case of goods dutiable on gross weight and subject to a specific tare allowance for containers, this allowance is made only on articles packed in boxes, barrels, crates, and other regular receptacles. However, for some articles a tare allowance is specified for lighter forms of packing, such as bales. Packages may be marked with either stencil or brush. Weights need not be marked on the packages.

Denmark.—Climate and transportation conditions are comparable to those of the northern United States. Goods are landed at modern wharves. There are no restrictions as to marks, weights, etc. Duty is assessed on the basis of net weight, which includes the weight of individual receptacles in which goods are sold at retail, as well as paper or cloth wrappers. The steamship companies have certain regulations which should be investigated and followed.

Dominican Republic.—Terminal facilities are poor and goods are landed in lighters. There are direct steamers from New York to a few ports; transhipment is necessary to reach others. Interior communications are primitive. The climate is subtropical with much rain. Goods should be packed to withstand the hazards of the elements and hard handling, with specially good waterproof protection and every device against pilfering. Packages should not be inconveniently large.

Duties are assessed either on the basis of gross or net weight. The following regulations and definitions are

taken from the Dominican customs tariff in force January 1, 1910:

"Rule 29. No duty shall be collected on outer coverings containing articles dutiable on net weight, by the piece, or free of duty, if such coverings are in general use for packing at the time when imported, except watertight coopers' wares containing any of the above merchandise, which shall be dutiable. Coverings of merchandise (outer or inner), of material or form designed to evade duties, or which may be used for other purposes than common packing, or of unusual form, shall be subject to duty under paragraphs of the tariff to which they correspond by classification. Inner packing containing merchandise paying duty on the net weight shall in no case pay a lower rate of duty than their contents. Cases of jewelry, used as immediate containers therefor, shall be dutiable under their respective paragraphs.

"Rule 30.—Whenever merchandise shall be dutiable on gross weight, the dutiable weight of such merchandise shall include the weight of all covers, receptacles, wrappers, packages, and packing of every description, whether outer, inner or immediate, without any allowance for tare.

"Rule 31. In all instances where merchandise shall be dutiable on net weight, the dutiable weight of such merchandise shall not include any common outer cover, receptacle, package, wrapper or packing, but shall include all inner or immediate receptacles, including cards and cartons, not subject to a higher rate of duty. Loose straw, shavings, excelsior, paper, sawdust, or other similar materials, interposed between the outer receptacle and immediate container of the merchandise to steady and protect the same, shall not be considered as part of the immediate container.

"Rule 32. When goods dutiable on net weight, by the piece, ad valorem, or free of duty, are imported in the same container with others dutiable on gross weight, the former shall be assessed on their net weight, as defined in rule 31, by the piece, ad valorem, or shall be free of duty, as the case may be, and the latter shall be duti-

able on the net weight, as defined in Rule 31, with an addition of 25 per cent thereof.

"Rule 33. All the provisions of Rules 30, 31, and 32 regarding gross and net weight shall be applicable to goods subject to compound duties, when the gross or net weight forms part of the compound duty."

Weights need not be marked on the packages. Packages may be marked with a stencil or brush.

Dutch East Indies.—Goods should be packed to withstand discharge into lighters and hazards of an excessively tropical climate. Consular regulations are those of Holland. There are regular, direct steamship services from the United States to some of the principal ports. The tariff assesses both ad valorem and specific duties based on weight. The regulations of the steamship companies should be investigated. No special packing considerations are otherwise called for, unless especially instructed by customers. General information about these colonies may be had from consuls of Holland.

Dutch Guiana.—Shipments must be prepared to meet every hazard of a tropical climate, landing and transportation. There are direct steamers from New York to Paramaribo. There are no restrictions as to shipping marks, etc., except such as are prescribed by the different steamship companies. Most articles dutiable by weight are dutiable either by gross or net weight as the importer may elect. Consignees' instructions with respect to packing should therefore be carefully followed. Consuls of Holland may be asked for general information about Dutch Guiana.

Dutch West Indies.—The Dutch colonies in the West Indies comprise the islands of Curaçao, Bonaire, Aruba, Saba, St. Eustatius and half of the island of St. Martin. The interests of these islands are in the care of consular officials of the Netherlands, from whom any special information should be sought.

The climate of these islands is subtropical and heavy rains are prevalent. Willemstadt, the port of Curaçao, is reached by several direct steamship lines from New York and one from New Orleans. The islands of Saba and St. Eustatius, in the Leeward Islands, are reached by transhipment via St. Kitts, while St. Martin is reached at irregular intervals by direct steamers from New York. Packing should be prepared with these conditions in view.

Ecuador.—Goods for Ecuador should be protected in every way against bad handling and climatic conditions, ranging from torrid tropical on the coast to cool in the mountains at elevations of thousands of feet. Guayaquil is sometimes reached by direct steamers, but transhipment is common. All forms of transportation and terminal facilities are most primitive. Cargo is lightered ashore from arriving steamers and is handled many times over by hand before reaching destination. Cases should not, if avoidable, exceed 112 pounds in weight, to facilitate handling and interior transportation.

Customs duties are assessed either on the basis of gross or net weight, according to the kind of merchandise. Although goods subject to different rates of duty may be packed in the same container without being subjected to any official penalty, consuls of Ecuador require, when this practice is followed, that the shipper state in the consular invoice the net weight in kilos of each kind of merchandise so included, as well as the gross weight of the entire package.

Packages may be marked with a stencil or brush and should show gross weight in kilos.

Egypt.—The climate of Egypt is hot and dry. Alexandria is reached by direct steamers from New York, but not infrequently transhipment is necessary. Cargo is sometimes landed directly on the quays in Alexandria, sometimes by lighter. There are excellent railways and the Nile boat services are satisfactory. Apart from special instructions which may be received, no special attention is required so far as size and weight of packages are concerned, although it should be noted that unskilled native hand labor is utilized and some difficulties are experienced with very heavy pieces.

There are no official restrictions with regard to marking, but certain of the steamship companies require that the gross weight in pounds must be marked on packages and these and other regulations should be carefully investigated. The interests of Egypt in the United States are in charge of British consular officials. The majority of duties levied by the Egyptian tariff are ad valorem and call for no remark.

Finland.—Articles specifically named in the tariff are dutiable on the basis of gross weight. All other articles pay duty according to the table of tare allowances annexed to the tariff, or when no tare has been established, on the basis of net weight. A new tariff has been in force in Finland since April 1, 1919, under which certain specified machinery and other articles are subject to an ad valorem duty. In view of the prevailing conditions at the present time the consular regulations and those of the steamship companies should be investigated and followed. The climate of Finland may be described as similar to that of eastern Canada. Helsingfors is an up-to-date port, with modern facilities, reached by direct sailings from New York, as are from time to time other Finnish ports. Packing requires no unusual attention, except as specific instructions may be given by importers.

France.—Transportation and climatic conditions in France are comparable to those in the United States. Landing facilities at the ports are of the best. Goods must be packed for ocean shipment and this means good, strong, well-protected, cases or crates. Before packing or making shipment the consul general of France should be consulted in reference to the latest customs rulings obtaining. Many changes have been made in the past year and it is impossible to foretell further changes in view of international trade conditions. The various shipping companies likewise have certain regulations which should be investigated and followed.

French regulations with respect to the importation of pharmaceutical preparations, jewelry and other articles of gold, silver, or platinum are very strict and should

be carefully investigated. Information with respect to these and other regulations may be obtained from French consular officials or from the offices of the French High Commission in New York City.

French Guiana.—Freight, to reach this colony, must be transhipped en route. The climate is tropical, landing facilities and interior transportation conditions primitive. Packing should be thoroughly waterproof, sturdy, but preferably in cases of not excessive weight. The consular regulations governing shipments to that country are identical with those governing shipments to France. French consuls are sources of information regarding the colony.

French Indo-China.—The consular regulations governing shipments to French Indo-China are identical with those governing shipments to France. Packing must be prepared to meet all climatic and shipping hazards. The colony lies in the tropics and freight is usually transhipped once, or oftener, en route. General conditions may be likened to those described under China. Consuls of France may be asked as to conditions in the colony.

French Somaliland.—The port of Djibouti is practically a free port, largely notable as the port of entry for Abyssinia. Goods must be packed to withstand the tropical climate and all hazards of transportation. In the absence of direct steamship lines, freight has to be transhipped en route and traverses the torrid waters of the Red Sea. There are no official restrictions as to marks or weights, but the regulations of the steamship companies should be investigated. The interests of the colony are in the hands of consuls of France.

French West Indies.—The French colonies in the West Indies consist of the island of Guadeloupe, the smaller islands of Les Saintes, Désirade, St. Barthélemy, the Marie Galante Islands and half of the island of St. Martin, all dependencies of Guadeloupe and the island of Martinique. The interests of these islands are cared for by French consular officials, to whom special inquiries may be addressed.

The climate of all these islands is subtropical, and they are subject to the heavy rains characteristic of the West Indies. Guadeloupe and Martinique are served by direct steamers from New York and other American ports, the smaller islands being ordinarily reached by transhipment to smaller coasting vessels. Packing should be able to withstand the hazards incident upon transhipment and rough handling, and adequate waterproof protection should always be given. French consular regulations apply to shipments to the French West Indies. The regulations of the steamship companies should be investigated.

Germany.—Climatic conditions in Germany are similar to those obtaining in the northern United States and this is likewise normally true of excellent railway transportation and most modern port conditions. There are numerous direct steamer connections. Customs requirements should in each instance be investigated until conditions are more clearly defined and stabilized than at present. Under the former German tariff, articles on which the rate of duty did not exceed 6 marks per 100 kilos were dutiable on the basis of gross weight; while on articles subject to a higher rate of duty a tare allowance based upon a fixed schedule was provided.

Greece.—Goods shipped to Greece must be well packed to withstand hazards of maritime and land transportation. The climate does not offer difficulties for the packer, being similar to that of our own South Atlantic States. Duty is levied, with a few exceptions, on legal net weight. There are no government restrictions as to marks, weights, etc., but the different steamship companies have certain regulations of their own which should be followed.

There are steamship lines direct from New York to Piræus (the port of Athens) Patras and Salonica, but a large part of the cargo for other ports of Greece is transhipped there or elsewhere en route and these transhipments must be taken into account in preparing suitable packing. Cargo is taken ashore in lighters.

Guatemala.—Climatic conditions in Guatemala vary from tropical to temperate. Direct steamers from the United States reach both Caribbean and Pacific ports. Goods must be packed well to withstand transhipment by lighters and very primitive methods of interior transportation in the many districts not reached by the single railway. Pack mules are in common use.

Merchandise is dutiable either on the basis of net weight or on the basis of weight including packing with the exception of outer containers, or on the basis of gross weight, as may be provided by the customs tariff. If merchandise which is dutiable on weight including packing is imported loose in an outer container, the weight of the outer container is not included in the weight subject to duty. If merchandise which is dutiable on the basis of weight including packing is imported in the same container with merchandise dutiable on the basis of gross weight, the merchandise dutiable on gross weight is subject to duty on the basis of weight including packing, with the addition of one-fourth the duty so levied in compensation for the weight of the container. With respect to wrapping, only oil cloth and tarpaulin are considered a part of the packing and cloth wrapping must be declared for duty. The customs authorities at Guatemala impose a fine on packages containing merchandise subject to different rates of duty. It is, therefore, desirable that the exporter obtain complete packing instructions from the importer in Guatemala.

The exporter should consider carefully the nature of the goods and whether the duty is based on gross or net weight; a custom tariff of Guatemala should be at hand for reference. It is not enough that the goods be well and carefully packed; the packing must be done with reference to the tariff situation.

Packages may be marked with stencil or brush. Weights need not appear on packages, but each package must be numbered. A different number must be put on each package in the same shipment and these numbers must correspond with those given in the consular invoice.

The Guatemalan government imposes strict regulations with respect to the importation of telephone and telegraph apparatus and pharmaceutical preparations. These can be obtained from the consul general of that country in New York City.

Haiti.—The same general statements made with reference to the Dominican Republic apply with equal force to Haiti as to climate, interior transportation and packing protection. Goods destined for this country should be well and securely packed to resist every imaginable hazard. There are direct steamers from New York to the principal ports of the republic but lighterage and wharfage facilities are bad.

Merchandise on which, under the Haitian tariff, duties are assessed on the basis of weight, is dutiable on net weight.

Packages may be marked with stencil or brush and must bear consecutive numbers, the net weight in pounds, the countermarks, and the name or initials of consignees.

Hawaiian Islands.—Honolulu is reached by direct steamers from San Francisco. Freight is landed directly on the wharves, as a rule, and general facilities are good. There are no restrictions as to marks except those prescribed by the different steamship companies. The climate is subtropical. Information relating to the islands may be obtained from the Bureau of Insular Affairs, Washington, D. C., for it should not be forgotten that the islands are not "foreign" but are a part of the United States, and no consideration of customs regulations is called for, so far as they may affect packing.

Holland.—Transportation and climatic conditions are similar to those obtaining in the United States. Frequent direct steamers reach Rotterdam and Amsterdam, landing facilities as well as railway and canal services are most modern. There are no restrictions as to weight and marks except such as are prescribed by the various shipping companies. Nearly all duties assessed by the Dutch tariff are low and goods which pay duty on the basis of weight are dutiable on their legal net weight.

Honduras.—Goods must be packed to resist severe conditions of transhipment, landing and most primitive interior transportation. The climate is chiefly tropical, varying to temperate according to elevation above the sea.

All goods are dutiable on the basis of gross weight; goods subject to different rates of duty may be packed in one container without penalty.

There are direct steamers from New York and New Orleans to some of the ports in the Caribbean coast. Goods shipped to Tegucigalpa and the interior of Honduras come either direct by steamer from San Francisco to Amapala, or from New York via Panama by transhipment to Amapala. Here they are reshipped to San Lorenzo, a small port near Amapala, and thence to the interior by ox-cart. It has heretofore required from 8 to 12 days for the freight to reach the capital after leaving the coast, but it is understood that better service is lately available. Cargo is often handled in an extremely rough manner, especially on the Pacific side, although American companies operating to the Caribbean ports offer fairly good facilities.

After the goods are landed comes the long jolting in the ox-cart for many days, and then a journey on muleback to reach the many points where there are no roads, which will discover every possible weakness and complete damage that was started in earlier stages of the voyage. Furthermore, the rainy season lasts from five to six months, and during this time it rains hard and frequently. The best of waterproof protection is essential.

The statements in reference to freight also apply to parcel post shipments, the mail being transported on muleback from the north and south coasts, a trip of from three to six days. Rivers have to be crossed, rains are frequent, and the ropes lashing the packages to the mules have to be drawn tight. It takes from six weeks to several months before an importer in the interior of Honduras gets his goods, and it is vitally important that these goods arrive in good shape after this long lapse of time.

Goods to be consumed in the port towns may be packed in large cases, preferably not to exceed 220 pounds in weight, but goods for the interior must be packed to meet the transportation facilities. If a package weighs 150 pounds a mule can carry only one, and this must be placed on the backbone of the animal. Two packages of 125 pounds each, however, can be strapped one on each side.

Packing for Honduras is a very intricate problem in view of the assessment of duties on the gross weight of the packed merchandise, indicating the desirability of the lightest possible containers, while rough treatment in transit and the crudest of handling and transportation facilities demand amply stout and waterproof protection.

India.—Shipments to India must be prepared to meet the extreme hazards of a most tropical climate in addition to passing en route through the hottest waters of the globe. Direct steamers from New York to Pacific coast ports may always be found for shipping to Bombay and Calcutta, sometimes for other Indian ports also. There are piers and quays at some of the principal ports, but even in such ports cargo is usually landed by lighters and handled by unskilled and careless native labor. Railways connect the leading cities of India, but points off the railway lines are reached by bullock-cart. However, this need give the ordinary shipper no concern, since repacking for the remote interior, except in the case of special machinery, is always undertaken by the large importers in the principal cities.

A large number of articles imported into India are dutiable at the rate of 7½ per cent ad valorem, and the Indian tariff likewise provides a large free list. Certain of the steamship companies require that the gross weight in pounds be marked on packages destined to India and Ceylon, and these and other regulations should be carefully investigated.

Both India and Ceylon have Merchandise Marks Acts which provide that all goods made or produced beyond the limits of the United Kingdom and British India, must

arrive in India with the names or trade marks on them accompanied by a definite indication of the countries of origin, which must be shown in letters as large or conspicuous as any letter in the name or trade mark and in the same language and characters as the name or trade mark.

The following summary of the provisions of the act and suggestions as to procedure were compiled by a former American consul at Bombay:

"It is generally assumed, under the provisions of the Indian merchandise-mark legislation, that whenever the English language is used, either in trademarks or in descriptions of imported goods, the country of origin is the United Kingdom. Otherwise there is intent to deceive and violate the law, unless there is a clear counter indication that the goods were manufactured elsewhere. Therefore, in the case of goods manufactured in the United States, the counter indication, 'Made in the U. S. A.,' should appear in clear letters. It is held insufficient to mark simply 'U. S. A.' If goods from the United States are marked with the name of a city which might also be the name of a city or place in the United Kingdom or British India, the name should be accompanied by further names to indicate that it is in the United States. For instance, Boston in Massachusetts should be accompanied by the name 'United States' or by the initials 'U. S. A.' or by the word 'Massachusetts.'

"All counterfeit trade-marks and all false descriptions of any sort are strictly forbidden in the case of goods imported into India. The expression 'trade-mark' means in India any trade-mark, which, either with or without registration, is protected by law in any British possession or foreign State; and the expression 'counterfeit' means a deceptive resemblance, which need not be exact, of one thing to another thing. A false trade description means a trade description which is untrue in a material respect as regards the goods to which it is applied.

"Piece goods in India, ordinarily sold by length or by

the piece, should have the length in standard yards stamped conspicuously in English numerals on each piece. Piece goods include woolen goods of all kinds, and the following cotton goods: Cambrics, checks, spots and stripes, chudders, chudder dhooties, dhooties, domestics, doorias, drills, jaconets, jeans, lappets, lawns, lenos, long-cloths, madapollams, mulls, muslins, nainsooks, printers, prints, sarries, scarfs (eklai), sheetings, shirtings, tanjibs, twills, T cloths, and Mexicans. Other classes of piece goods are not detained if unstamped. The same applies to unstamped cotton and woolen piece goods imported for the personal use of individuals or private associations, and not for trade purposes. A trade description of length stamped on gray, white, or colored cotton piece goods is not deemed to be false in a material respect, unless where a single length is stamped, the description exceeds actual length by more than 4 inches in pieces stamped as 10 yards long, and 18 inches in pieces stamped as above 47 yards long, provided that the average length of the goods in question does not measure less than the stamped length. Although no trade description of width seems to be necessary, if one appears it is not considered false if it exceeds the actual width by one-half inch in pieces stamped as 40 inches or less in width, or 1 inch in pieces stamped as 50 inches or more in width, provided the average width is not less than the stamped width.

"In cases where indication of origin is required to be marked, when the English language is used for goods made outside of the United Kingdom, the counter indication should be adjacent on the same label, or part of the covering of the goods, as the case may be, to which the name, trade-mark, or trade description is applied. It should not be on a separate label, or otherwise detachable from the application of the name, trade-mark, or trade description itself; and it should be applied no less indelibly than the latter. It should be repeated for all applications of the name, trade-mark, or false trade description, except when the latter are reproduced in such close

proximity that one prominent counter indication will suffice to cover all. If different languages or characters, English or Indian, are used for the names or included in the trade-marks, the counter indication should be repeated in each language.

"Statements, descriptions or numerals, on labels or tickets applied to boxes, cartons, parcels, or other packages, which are manifestly intended only for the purpose of identifying articles for the convenience of dealers and shopkeeepers, and are not specially intended to attract the eye of the purchaser, are not treated as trade descriptions; such for instance, as on bundles of hosiery, 'Hose, brown merino, size 10;' on shoes, 'Enameled leather, men's No. 6;' on hats, 'Brown felt, hard, No. 7,' so long as such marks or descriptions are not on the goods themselves.

"Counter indications are required in connection with words in any Indian language, or letters or numerals in Indian character, or other marks or devices, as representations of Indian deities or emblems which might lead persons to believe that the goods were made or produced in British India, the same principle being thus applied as to goods made or produced outside the United Kingdom but using the English language in trade-marks and descriptions.

"Samples or patterns of goods, which are readily distinguishable as such and valueless in themselves, are not subject to the legal provisions regarding marking of origin.

"Although any formal registration of marks, names, or initials is prohibited in Indian custom houses, yet goods are excluded if it should be shown that an attempt has been made to counterfeit some established mark or other indication that is well known to the customs officials. There is at present considerable agitation in India for a law requiring registration for trade-marks, and punishment for counterfeiting registered trade-marks; and it seems likely that there may soon be one to that effect. In regard to dealing with various false

descriptions, customs officials are instructed that there should be due consideration given to the provision that a trade description to be false must be 'untrue in a material respect.' When there are indications that goods are of a certain standard composition, such as the letters B. P. (British Pharmacopœia) in the case of drugs, the description would be regarded as false unless composition was in accordance with the standard."

More particular and detailed instructions as to the marking of merchandise and trade description may be obtained by a study of the Merchandise Marks Manual, a book officially published by the Superintendent of Government Printing at Calcutta, which reviews the various laws and regulations, contains many special rulings and examples as to their proper application. The advice and instruction of local importers should, in all cases, be followed exactly since the interpretation of the Merchandise Marks Laws, especially as regards trade description, is, to a large extent, dependent upon the individual judgment or ideas of individual collectors of customs at various ports, some of whom are inclined to be liberal and some not. Local firms which have had considerable experience with more or less involved questions concerning the marking of merchandise and with local rulings covering these questions, are, as a general rule, able to provide clearer instructions than those which may be obtained from the Merchandise Marks Manual.

Italy.—There are no special difficulties with respect to climate or interior transportation to be observed in preparing shipments for Italy, but packing should provide against the danger of pilfering and be able to withstand the hazards of ocean transportation. Direct steamers reach all principal ports, where landing facilities are unusually good. Interior railway services are modern and satisfactory. The climate may be likened to that of California.

With few exceptions duty is assessed, on articles subject to a rate of duty less than 20 lire, per 100 kilos, on the basis of gross weight; on articles paying a higher

rate of duty, duty is assessed either on the basis of actual or legal net weight. There are at present many customs restrictions in force concerning which information may be obtained from the Italian consul general, New York City.

On shipments of tobacco weights must be marked on packages, and containers of medicinal products must specify the dose and the chief ingredients. The steamship companies also have certain requirements which should be investigated and followed.

Italian Somaliland (Eritrea).—Duties are, with few exceptions, ad valorem. There are no official restrictions on marks or weights, but the regulations of the steamship companies should be investigated. There are no direct steamers and all freight must be transhipped en route. Packing should be of such a nature as to withstand all hazards of rough transportation and an exceedingly tropical climate. Italian consuls may be asked as to special information regarding this colony.

Jamaica.—The climate of Jamaica is subtropical. Some of the principal ports of the island are reached by direct steamers, others are served by transhipping to small steam or sailing coastal vessels, involving repeated risks through additional handling. Further damage may be incurred in transfers to custom houses which are not located immediately on the landing stages. Railways and good highways reach the interior. No restrictions are prescribed as to marks and weights of packages. The steamship companies, however, have certain requirements which should be investigated and followed. Adequate waterproof protection to packages should always be given, in view of the frequency of exposure to rain.

All commercial invoices should state that the cost of the outer packing is included in the cost of the goods, for otherwise duty will be assessed on the packing or containers. The custom laws provide that "in respect of goods liable to duty on the value thereof, the value of all outside and inside coverings or receptacles containing such goods, together with the value of all labels, wrap-

pers, or other attachments, shall be deemed to be a portion of the value of such goods for duty, and shall be included in such value." Even in the case of rated or free goods the packing or coverings are subject to duty when they are apparently designed for other use than the importation of the goods, and the packages of rated goods are generally liable to duty. Moreover, when a package contains ad valorum goods and free goods the outer package shall be liable to the same rate of duty as the ad valorum goods.

Japan.—Goods must be packed to withstand severe handling. Climatic conditions, like those of our own northern states, offer no difficulties. There are no government restrictions as to marks, weights, etc., although the steamship companies have regulations of their own which should be investigated and followed. As a rule the net weight is taken as a base for calculating duties on commodities which are dutiable by weight. However, raw materials are mostly duty free; half manufactured articles pay light duties; on manufactured articles the duties range from 15 to 50 per cent. There are direct sailings for some of the principal Japanese ports from New York and from our own Pacific ports. Japan boasts good railway and coasting steamer services. Special packing is, as a rule, only required when so ordered.

Jugo-Slavia.—Transportation facilities in the new state of Jugo-Slavia are not yet in a normal condition. There are comparatively insufficient railway facilities, but imports are usually repacked by local merchants for interior distribution. The climate is temperate. Under the former Serbian tariff merchandise dutiable at a rate of less than 10 dinars per 100 kilos is, with few exceptions, subject to duty on the basis of gross weight. Merchandise subject to a higher rate of duty than 10 dinars per 100 kilos is, with few exceptions, subject to duty on the basis of legal net weight with specified tare allowance fixed under a tare schedule. In view of the prevailing conditions the consular regulations and those of the steamship companies should be investigated and followed.

Madagascar.—The French tariff, with certain exceptions, and French consular regulations apply. Goods are discharged in lighters at Tamatave. Packing should be of such a nature as to withstand tropical climate and all hazards of transportation, including transhipping en route as there are rarely direct sailings from the United States. General information may be sought from consuls of France.

Madeira Islands.—The customs regulations given under Portugal apply. The climate is tropical. In the absence of direct steamship connections, transhipping en route is required and freight is usually landed by lighter, thus further increasing the handling of packages. The islands are a possession of Portugal and consuls of that country may be asked for general information.

Mauritius.—The tariff assesses specific duties based on weight and other units. Goods should be packed to withstand tropical climate and all hazards of transportation. There are no official restrictions as to marks and weights. As there are seldom direct sailings from American ports, transhipment must be expected and provided against. The island is a British possession and information may be sought from consuls of the United Kingdom.

Mexico.—Goods for Mexico are shipped by direct all-water, all-rail or by combined rail and water route. Goods destined for interior points not reached by railroad are transported by men or animals, and consequently the method of packing depends on the route selected, and the location of the point of destination. The climate of Mexico varies from that of the tropics, along the coast and in the south, to that of the temperate zone, in the cities situated in the central tableland, several thousand feet above sea level. Again transhipment conditions vary greatly, Vera Cruz and Tampico, on the east coast, although not good as ports or with perfect equipment, having vastly superior shipping and landing facilities to the open roadsteads of Progreso, other minor ports of the east coast and all those on the west coast,

where the landing of cargo may be both difficult and hazardous, involving great risks to packing.

The duty on merchandise dutiable by weight is levied on net, legal, or gross weight, according to the provisions of the tariff. No penalty is imposed for mixed packing, if the merchandise is declared properly. The following definitions and rules are taken from the general regulations for the application of the tariff:

"By net weight is meant the weight of the goods alone without inner or outer packing.

"By legal weight is meant the weight of the goods together with that of their inner packing, such as wrappers, receptacles, cardboard and wooden boxes, tins, etc., inclosed in the outer packing case. When goods dutiable on legal weight are not inclosed in inner packages, but in one receptacle only, the weight of the goods alone will be considered as the legal weight. In establishing the legal weight no account will be taken of the straw or shavings in which the inner packages are placed or of the weight of the outer receptacle.

"By gross weight is meant the weight of the goods with all their outside and inside coverings, without deducting the weight of the hoops, etc., used for packing. When a package contains different goods dutiable on gross weight, the customs shall, conformably to article 50 of the customs regulations, determine the tare in proportion to the legal weight assigned to each kind of goods.

"Goods dutiable on gross weight imported without any kind of packing or packed in a material which is also dutiable shall pay duty on the total weight of the goods."

The rules regarding mixed packing are given as follows in the customs regulations:

"When a package contains several kinds of merchandise, subject to different rates of duty, including some dutiable on gross weight, the declaration in the invoice should indicate, in addition to the total weight of the package, the legal weight of each class of merchandise contained therein, in order to facilitate a proportional division of the gross weight. This declaration of the legal

weight shall in no way affect the declaration of net weight, unit, pair, thousand, or measure required for the liquidation of the duty on the merchandise not dutiable on gross weight.

"Shippers may pack in one case several parcels, boxes, bags, bales, or other packages containing the same class of goods, provided that they specify in the consular invoice the number of packages contained in each bundle, bale, or case. Failure to comply with this requirement or to furnish said information within the time limit allowed by law is punishable by a fine not to exceed 50 pesos. This information is not required in the case of the following classes of merchandise:

"1. Bulky articles which are commonly shipped packed together, such as iron and steel bars, tubing, sheet metal, shingles and staves, wooden and metal casks, buckets, parts of machinery, and similar merchandise, and articles free of duty.

"2. Tins or interior packing of the merchandise contained in each package.

"3. Pieces of cloth packed in bales or boxes; bottles or casks containing articles of food, drugs, perfumery, etc., and, in general, all small packages, bags, boxes, or other kind of receptacle contained in one strong package."

Packages may be marked either with a stencil or brush. Weight need not be marked on the packages.

Every package must be marked with the name, initial or mark of consignee and the destination in full. The packages of each consignment should be marked consecutively. If possible, goods paying different duties should not be packed together, that is, goods assessed on gross weight should not be packed with goods assessed on legal or net weight.

It is of the utmost importance that goods be packed in accordance with any special instructions that the importer may give. For example, instructions that certain articles be knocked down and the different parts securely boxed in certain size packages, and no package to weigh

over a certain amount, may seem irksome to follow, but if final transportation of the shipment must be made by mule or burro, machinery weighing two or three tons cannot well be taken apart at a small interior railroad station. The routing of shipments is also important. Goods shipped by sea should be more strongly boxed and be better protected by waterproofing against sea spray and tropical humidity, than goods routed by all-rail lines.

The following is a condensation of a paper read by Mr. H. H. Miller, of Torreon, Mexico, at the trade conference held at Mexico City early this year:

After goods or merchandise of any kind have passed through all the various stages from the raw material to the finished product and have been sold they must then be packed, billed, and shipped to the purchaser. If this is not done so that they reach their final destination in perfect condition, the work of manufacturing and marketing them will be either partly or entirely lost.

A Torreon importer sends the following list of instructions with his orders to the United States:

"1. All boxes must be strapped or wired.

"2. All cartons containing glass shipped by freight should be crated.

"3. Put large stickers on glassware containers: 'Glass-Vidrio.'

"4. Machinery having small parts exposed must be boxed.

"5. All other machinery must be crated.

"6. Number packages consecutively.

"7. Mark gross, tare, and net weight on each package.

"8. Send original of bill of lading, packing list, and manifest and copy of invoice to customs broker named.

"9. Send original of invoice and copies of manifest and packing list to me here.

"10. Mark plainly on manifest if shipment is to be forwarded by freight or express, according to my instructions.

"11. All shipments should be marked to me at

border point and in care of the customs broker named.

"12. Do not split shipments."

There is a reason for each of these instructions, and failure to comply with any one of them may mean delay or extra expense to the purchaser.

Discussion of Instructions.—Comment on the first three is not necessary. Most reliable houses comply with them even if they are not included in the shipping instructions.

Nos. 4 and 5.—Aside from protection against breakage and loss of pieces, there is another reason for boxing or crating machines. In Mexico an extra 50 per cent is added to the regular freight rates on all machinery in less than carload lots that is not boxed or crated.

No. 6.—Numbering the boxes or packages is very important. It is the only way to check them against the packing list, which should be sent to the customs broker who is to pass the shipment across the border and forward it.

A great many shippers do not seem to understand the nature of a packing list and a manifest, or the necessity of making them, so it might be well to give a little time to the details of forwarding a shipment from a border point to the interior of Mexico. In the old days the railroads and express companies could receive shipments consigned to Mexico and give receipts or bills of lading from their point of origin in the United States to their final destination. Now it is different, and everything sent either by freight or express must be reshipped from the border point the same as a new shipment originating there.

If a shipment is made to John Jones at Torreon, it is not sent direct to Torreon, but in care of a designated customs broker at El Paso, Eagle Pass, or other port of entry. The bill of lading, packing list, manifest, and copy of invoice must also be sent to this same customs broker, so that he will be in a position to apply for a consular invoice, comply with all the requirements of the custom-house, and at the same time act intelligently

and with despatch for the consignor and the consignee.

When a shipment reaches the border, if it is a full carload, the broker may put up a $2,000 bond guaranteeing the safe return of the car to the United States and get permission to have it switched to the Mexican side, where the contents are transferred to another car. If it is less than a carload it is carried across in trucks. A consular invoice, the packing list, manifest, and copy of invoice goes with the goods to the custom-house.

At the custom-house the officials are supposed to open each box, inspect and weigh the contents, check them against packing lists and manifests, and assess the duties. As a rule they do not open all, if the papers and documents are made out properly so they can obtain the necessary data from them instead of from an actual inspection of the packages themselves. If no packing lists or manifests are furnished, it is absolutely necessary to open and unpack everything in order to get the proper weight and values and figure the duties. This takes some time, and there is always danger of small or fragile articles being broken or lost in the operation. From the custom-house they go to the freight or express office, where they are reshipped to their final destination.

Explanation of Terms.—A packing list gives the number of each box or package in the shipment and a list of its contents. A manifest gives the weight, kind of material, and value of each article in the packages. A good form frequently used which is an invoice, packing list, and manifest all in one, is more or less as follows:

Chicago, Ill., November 15, 1919.

Sold to H. H. Miller, Torreon, Coahuila, Mexico.

Shipped to H. H. Miller, care of T. J. Woodside, El Paso, Tex.; by freight to El Paso; from Juarez to Torreon by express.

Box No. 1. Gross weight, 75 kilos.
Net weight, 65 kilos.

1 steel miter box, steel and brass, 40 kilos...$12
2 dozen 12-inch files, steel, 12 kilos..... 15
3 dozen hack-saw blades, steel, 13 kilos..... 9

Marking of Weights Necessary.—No. 7.—Marking the gross, tare, and net weight on the package is for the convenience of the forwarding agent and the customs house employees. It very often saves time and extra work and should not be overlooked.

The metric system is the legal standard for weight in Mexico and is the one used for figuring the duties, so it is better to give all weights in kilos if possible. A few houses give the weight in kilos, for the benefit of the customs house, and also in pounds, for the convenience of themselves and customers. Weights given in pounds only entail some work in figuring their metric equivalent, but can be used and are far better than no weights at all.

Buyers sometimes instruct to give gross, net and legal weights of each article, as duties on some classes of goods are based on the gross weight, some on the net, and others on the legal weight. It is rather hard to give a set rule covering this point and the billing clerk should be able to judge by the nature of the articles themselves what weights should be given. In many cases, aside from the weight of the packing case, there are no gross or legal weights to be considered. Legal weight means the weight of the article itself and of its container or immediate wrapping, as bottles of medicine or canned goods. In this class of goods the legal weight should be given and marked as "legal."

Some European houses have experts on the customs regulations of the various countries and give the classification each article in the shipment should come under and the rate of duty it should pay. This is a great convenience to the forwarding agent and to the man who receives the goods. In case of a doubt at the customs house as to the proper classification it enables the broker to select and insist on the one that is most favorable, and helps the purchaser to check his customs sheets and see if any excessive charges have been collected.

Consignment of Shipments.—Nos. 8 and 9.—When shipments are consigned to a customs broker at a border point and are to be reshipped by him, he must have the

original bill of lading. When we get back to the old style of business and a through bill of lading is given from point of origin to final destination, then the original must be sent to the consignee and a copy to the broker. The broker needs only a copy of the invoice, but should have originals of packing list and manifest. In case all three are made in one, like the form given above, a copy to the broker is all right. Considerable trouble has often been had on account of shippers sending original papers to the broker when he should have only the copies, and vice versa. If exporters would only look over the shipping instructions, they would avoid many delays and other inconveniences in Mexico and at the border.

No. 10.—Very often shipments are sent to the border by freight and forwarded from there to the interior by express. Sometimes it happens that something is wanted in a rush and the broker forwards it by freight, and at other times heavy machinery for which there is no hurry is sent by express. Generally this is because the broker has no specific instructions and uses his own judgment, which at times is wrong. If shipping instructions are given with the order relative to forwarding from the border, they should be noted clearly on the manifest that is sent to the broker.

No. 11.—Sometimes a broker receives shipments consigned direct to him and he does not know for whom they are intended. He must write for this information or wait till an inquiry or complaint is made. Everything shipped to him should also bear the name of the final consignee.

No. 12.—It is very important not to split the shipments as it causes extra trouble and expense.

New Zealand.—Terminal and transportation conditions in New Zealand are very good. There are direct sailings from New York and San Francisco for some of the principal ports where freight is transhipped by excellent coastal boats to minor ports. It must be remembered that goods destined to New Zealand as to all of the southern hemisphere must cross the equator and pass

through the tropical belt on their voyage there. The climate of New Zealand is temperate. There are no official restrictions as to marks or weights, but certain of the steamship companies have their own regulations which should be carefully investigated. The interests of New Zealand in the United States are cared for by British consular officials, from whom the official regulations may be obtained. No unusual attention or special packing is required for shipments to New Zealand, except as specific instructions may be received from consignees.

New Zealand laws are very strict with respect to labeling of food and pharmaceutical products and the marking of footwear. The following quotation from the Footwear Regulation Act of 1913 contains the most important requirements of the act:

"No person shall manufacture for sale, or sell, or offer or expose for sale any boots or shoes the soles of which consist wholly or partly of leather, or any imitation of leather, or of any material having the appearance of leather, unless:

"(a) The soles thereof are of leather without admixture or addition other than materials used for filling spaces, shanks, or rubber outsoles, or in the case of ladies' fancy or evening footwear, of heels of wood or celluloid; or

"(b) A statement of the material or materials composing the soles thereof is conspicuously and legibly stamped upon or impressed into the outer surface of the sole of each boot or shoe."

In all cases where, in accordance with the Footwear Regulation Act, 1913, of New Zealand, it is required that a statement of the material or materials composing the soles of any boots or shoes be stamped on or impressed into the outer surface of the sole, the following rules are to be observed:

"The statement shall be stamped in indelible ink on the soles of such boots or shoes and shall be in bold type of such size and distinctness that it may be read with ease by any person of normal sight at a distance of at least 5 feet.

"The statement shall be impressed into the soles by means of sunk or branded lettering of such size and distinctness that it may be read with ease by any person of normal sight at a distance of at least 5 feet, or shall be embossed on the soles in lettering of like size and distinctness."

The regulations with respect to food products and pharmaceutical preparations adopted under the "Sale of Food and Drugs Act" of March 4, 1913, apply both to imported commodities and those of local manufacture. Under this act it is provided that:

"2. (1) Except as hereinafter otherwise provided, it shall not be lawful for any person, after the commencement of these regulations, to sell any package containing any food unless there is legibly and durably marked on or attached to that package a statement or label containing the following particulars, namely:

"(a) The name or trade-name, or description of the article;

"(b) In the case of compounded, mixed, or blended foods, words which indicate that the contents are compounded, mixed, or blended, together with the words 'imitation,' 'compound,' or 'blend,' as the case may require;

"(c) A statement of the net weight or volume, or of the true number, of the contents of any package, and any necessary statement regarding grade or quality. Unless otherwise specified, the statements required by this paragraph shall appear together in the principal label within a panel having a light-colored ground in gold-faced sans-serif capital types of not less than six points face measurement;

"(d) The name and address of the manufacturer of the article or of the seller thereof, or of the owner of the rights of manufacture, or of the agent of any of them;

"(e) Such other particulars as are required by the regulations in Part II hereof to be given in the case of any particular article;

"(f) Such other particulars as the manufacturer or

the seller, or the agent of either of them, desires to add.

"(2) No descriptive matter written on or attached to a package which contains any food shall include any comment on, reference to, or explanation of any statement or label required by these regulations to be written on or attached to any such package if such comment, reference, or explanation directly or by implication contradicts, qualifies, or modifies any such statement or the contents of such label.

"3 No label which describes any article of food shall include the word 'pure,' or any word of the same significance, unless the article is of the prescribed composition, strength, purity, or quality, and unless it is free from added foreign substances.

"4 Notwithstanding anything to the contrary in these regulations, words required to be written in types of size of not less than six points face measurement may be written in types of proportionately reduced size when the package containing a food or drug for sale is so small as to prevent the use of types of the prescribed size."

The act contains definite regulations with respect to the marking, preparation, and condition of purity required in a great variety of food and pharmaceutical products. It may be found in the "New Zealand Gazette" of March 6, 1913.

Nicaragua.—Transportation and transhipment conditions in Nicaragua are of the most primitive type, and goods should be packed to withstand every hazard of heat, humidity in tropical waters, bad handling and exposure to heavy rains during the rainy season.

Bluefields, on the Caribbean coast, is reached by direct steamers from New Orleans; ports on the Pacific side are connected with San Francisco by direct steamship service. The main port of entry is Corinto, which is connected with the capital by rail. There are good docks at this port. Apart from these, transhipment is necessary. Landing conditions are bad and interior transportation crude and rough. Many districts can only be reached by mules that can carry two packages of not

exceeding 125 pounds each. Freight is transferred from and to warehouses on men's backs.

It is not permitted to pack more than 10 kinds of merchandise in one receptacle. If articles subject to duty under different tariff classifications are packed in one receptacle each different class of goods must be packed or wrapped separately, or be in a different bundle, at the convenience of the shipper, so that its weight may be compared by the customs authorities with that declared in the invoice and the appropriate duty assessed on each class. If this requirement has not been complied with by the shipper an additional tax of 5 per cent on the tariff appraisement is assessed on the entire contents of the package.

The new Nicaraguan tariff, unlike the old tariff, assesses the greater number of duties on net weight. This is stated to be the weight of the goods including the weight of individual containers, such as cartons and so on. Toilet articles, perfumery and cosmetics must be packed in the containers in which they are going to be retailed, otherwise there will be a surtax of 100 per cent levied at the custom house. Packages may be marked with either stencil or brush. Weights need not appear on packages.

Norway.—Transportation; landing, and climatic conditions are in general similar to those of the United States, and there are no restrictions as to weights and marks other than those of the steamship companies. Direct steamers operate between American and Norwegian ports. Duty on most articles is assessed on the basis of legal net weight, but in some instances the weight of the outer receptacle only is deducted from the gross weight, the weight of the immediate packing being included in that subject to duty.

Panama.—Outside of the Canal Zone, traversed by the railway, the Republic of Panama offers only the most primitive transportation and terminal facilities with very rough handling at every stage. Packing should therefore be of the most sturdy character to resist tropical heat, humidity, perils of land and sea. Landing facilities at Colon are excellent and there are direct steamships. Most articles imported into Panama are subject to ad valorem duties.

Weights need not be indicated on the packages, which may be marked with stencil or brush.

Paraguay.—Transportation in Paraguay is almost exclusively by mule, carts, and boat. All goods for Asuncion are transhipped at Montevideo or Buenos Aires and all cases for transhipment must be marked with the number of the package, the destination, point of transhipment and the weight in kilos; all of which must follow the shipping mark. Packages should also be marked: "Tránsito para Paraguay," in order to avoid customs duties in Buenos Aires or Montevideo. The packing should be of the most sturdy character and designed to withstand hot weather, rains and all packing hazards, including at least one transhipment and possibly several.

Many classes of goods imported into Paraguay are dutiable on the weight of the goods and the individual container and frequently an effort is made to reduce this duty by shipping goods in bulk in a single container. Goods so shipped are dutiable on net weight and are subject to a surtax of 10 per cent.

Persia.—Packing should be able to take care of severe climatic and transportation hazards by land and sea. The greater part of the merchandise imported into Persia comes through ports on the Black and Caspian Seas and the Persian Gulf, to reach which at least one transhipment en route is usually required. Overland transportation is usually by camel, mule, or sometimes donkey. Since mules are commonly more readily available than are camels it is recommended that packages be oblong in shape, not to exceed 36x24x24 inches, and not weighing over 120 to 150 pounds, as mules carry a gross weight of 250 to 300 pounds in two packages. Camels in Persia can carry up to 400 pounds in two packages of not over 200 pounds each. There is constant loading, unloading

and rough handling, sometimes extending over weeks. The climate ranges from temperate, with wintry conditions in the Black Sea during the season, to tropical. There are no restrictions as to weights and marks other than those of the steamship companies. Duties are chiefly ad valorum or classified.

Peru.—Conditions of landing and interior transportation are very unsatisfactory. Cargo is usually lightered to shore, and there are no good harbors except Callao and Paita. There are direct steamship lines from the United States. The climate of Peru is temperate. Goods must be packed strongly against all perils; facilities are primitive and handling rough, and packages must be designed for transportation (when so ordered, or when destined for interior points) by llama, burro, porters, etc. The load of a llama is regarded as about 100 pounds, of a burro 150 to 200 pounds, divided into two packages, each half of those weights.

Duty on articles dutiable by weight may be assessed on the basis of gross weight; net weight, which is equivalent to the weight obtained by deducting tare allowance specifically indicated from the gross weight; or on the basis of legal weight, which is the weight of the merchandise, together with that of its packing, but which does not include the weight of the outer container. If merchandise subject to duty on the basis of gross weight is packed in the same container with other merchandise, either dutiable on another basis or subject to other rates of duty, the customs authorities add 25 per cent to the weight of the merchandise dutiable on gross weight, including its immediate packing and a proportionate share of the shavings, straw or other packing material. The regulations prescribe an addition of 60 per cent to the weight, in the case of pianos and beds. Separate duties are assessed on receptacles containing free goods as well as on those subject to a higher rate of duty than their contents. Packages may be marked with stencil or brush and should show the gross weight.

Philippine Islands.—Packing should be designed to withstand severe handling and intense tropical heat and humidity. The steamship companies' regulations with reference to marking should be strictly followed. There are direct steamship lines from both the east and west coasts of the United States. Special packing, if and when required, is always indicated in instructions received from Philippine importers. The islands being American, there are no import duties to be taken into consideration as affecting American goods. Information regarding the islands is available at the Bureau of Insular Affairs, War Department, Washington, D. C.

The following Sections of the Philippine Tariff Act of 1909 are of interest:

"RULE 13. (a) Whenever imported merchandise is subject to an ad valorem rate of duty, the duty shall be assessed upon the actual market value or wholesale price of such merchandise, as bought and sold in usual wholesale quantities, at the time of exportation to the Philippine Islands, in the principal markets of the country from whence imported, and in the condition in which such merchandise is there bought and sold for exportation to the Philippine Islands, or consigned to the Philippine Islands for sale, including the value of all cartons, cases, crates, boxes, sacks, and coverings of any kind, and all other costs, charges, and expenses incident to placing the merchandise in condition, packed ready for shipment to the Philippine Islands.

"(b) Whenever an article is subject to an alternative minimum ad valorem rate, the alternative ad valorem duty shall be ascertained by applying the corresponding ad valorem rate to such merchandise, inclusive of all costs and charges mentioned in clause (a) of this rule.

"(c) The term 'retail package' wherever used in this Act shall be held to mean any article, goods, wares, or merchandise, together with the holders, containers, packages, or packing, in which such article, goods, wares, or merchandise is usually held, contained, or packed at the time of its sale to the public in usual retail quantities.

"(d) Wherever it is provided in this Act that articles, goods, wares, or merchandise shall be dutiable, 'including weight of immediate containers,' the dutiable weight thereof shall be held to be the weight of same, together with the weight of the immediate container, holder, or packing only: *Provided,* That wherever in this Act the term 'including weight of immediate containers' and the term 'retail package' are both used in the same paragraph or clause, the dutiable weight shall be the weight of the retail package.

"(e) Wherever it is provided in this Act that articles, goods, wares, or merchandise shall be dutiable by 'gross weight,' the dutiable weight thereof shall be held to be the weight of same, together with the weight of all containers, packages, holders, and packing, of whatsoever kind or character, in which said articles, goods, wares, and merchandise are contained, held, or packed at the time of importation.

"(f) Articles, goods, wares, or merchandise affixed to card-board, cards, paper, wood, or similar common material shall be dutiable together with the weight of such packing.

"(g) The usual tapes, boards, and immediate wrapping shall be considered as a part of the dutiable weight of textiles.

"(h) No duties shall be assessed on account of the usual coverings or holdings of articles, goods, wares, or merchandise dutiable otherwise than ad valorem, nor those free of duty, except as in this Act expressly provided, but if there be used for covering or holding imported articles, goods, wares, or merchandise, whether dutiable or free, any unusual article, form, or material adapted for use otherwise than in the bona fide transportation of such articles, goods, wares, or merchandise to the Philippine Islands, duty shall be levied and collected on such covering or holding in accordance with corresponding paragraphs of this Act.

"(i) Whenever the interior container or packing of any article dutiable by weight is of an unusual character, including silk-lined cases, cases of fine wood, silk, leather, or imitations thereof, such as are used to contain jewelry, plate, trinkets, and the like, such containers or packing shall be dutiable at the rate applicable to the component material of chief value.

"(j) When a single package contains imported merchandise dutiable according to different weights, or weight and ad valorem, the common exterior receptacle shall be prorated and the different proportions thereof treated in accordance with the provisions of this rule as to the dutiability or nondutiability of such packing.

"(k) Where articles, goods, wares, or merchandise dutiable by weight, and not otherwise specially provided for, are customarily contained in packing, packages, or receptacles of uniform or similar character, it shall be the duty of the insular collector of customs, from time to time, to ascertain by tests the actual weight or quantity of such articles, goods, wares, or merchandise, and the actual weight of the packages, packing, or receptacles thereof, respectively, in which the same are customarily imported, and upon such ascertainment, to prescribe rules for estimating the dutiable weight or quantity thereof, and thereafter such articles, goods, wares, or merchandise imported in such customary packing, packages, or receptacles shall be entered and the duties thereon levied and collected upon the basis of such estimated dutiable weight or quantity: *Provided,* That if the importer, consignee, or agent shall be dissatisfied with such estimated dutiable weight or quantity, and shall file with the collector of customs prior to the delivery of the packages designated for examination a written specification of his objections thereto, or if the collector of customs shall have reason to doubt the exactness of the prescribed weight or quantity in any instance, it shall be his duty to cause such actual weights or quantities to be ascertained.

A. B. Cresap, General Manager of the Luzon Brokerage Company, makes the following statement:

"Many exporters in the United States seem to be of

the impression that foreign goods which have been imported into the United States and duty paid upon their entry, are 'free of duty' upon importation into the Philippine Islands. This is not the case. All foreign merchandise imported into the Philippine Islands is subject to duty regardless of the fact that it may have paid duty upon entry into the United States.

"One of the greatest sources of loss of the Philippine merchants on foreign merchandise imported from the United States, is from the fact that importers in the United States will ship foreign merchandise together with domestic merchandise in one invoice and fail to make notation of this on their invoices, and in the majority of cases, even certify that the entire invoice is of American origin or manufacture. In cases of this kind, the importer is subject to a fine of from one to five times the duty and, in almost every case, at least the minimum is imposed. In addition to this loss caused to the importer, by oversight or carelessness on the part of the shipper, the shipper is naturally placed under suspicion and all importations coming from him are most carefully scrutinized.

"Another very important matter is that of marking. Marks should be plain in big letters. If stencils are used, they should be placed at least on two sides of a package. Ninety-eight per cent of unclaimed merchandise which is sold in the Philippine Islands annually, and which runs into thousands of dollars, is because the marks have been rubbed off, or so mutilated that they cannot be read, or that the merchandise has been packed insufficiently and cannot be identified when it arrives in the Philippine Islands."

Poland.—Climatic conditions are temperate and offer no difficulties, and there is good railway service, in normal times, between the principal cities. Direct steamers ply from New York to Danzig, where landing facilities are satisfactory. The customs tariff of Poland as at present in force consists of 98 items covering articles subject to duty, the duties assessed being specific.

Porto Rico.—Transportation conditions by railway, motor truck and coasting vessels are normal. The climate of Porto Rico is tropical. All packages which may form the basis of commercial transactions must have the net weight or quantity plainly marked on the outside. There are strict regulations concerning the marking of bundles or other packages containing medicinal preparations of which distilled spirits form a component part. Porto Rico is United States territory and no import tariff affects American packing. The steamship companies make certain regulations with respect to packing that should be investigated and followed. Direct services connect the chief ports of the island with New York and New Orleans. Freight is usually lightered from steamer to shore.

Portugal.—Transportation, usually by railway, and climatic conditions, warm but not tropical, offer no difficulties. Packages may be marked with either stencil or brush, and some of the steamship companies require that the gross weight in kilos should appear upon the package. There are some direct sailings from New York, but freight may often be transhipped en route. Landing facilities are satisfactory. Duty is assessed on the basis of gross weight on merchandise subject to a rate of less than 5 reis per kilo. On articles subject to higher rates duty is assessed on the basis of either actual or legal net weight. There are strict regulations with respect to the labeling and packing of patent medicines and pharmaceutical preparations, which should be investigated by exporters of these products.

Portuguese East Africa (Mozambique).—The consular regulations of Portugal apply. Goods should be packed to withstand tropical climate. The port of Lourenço Marques has modern terminal facilities, but interior transportation is not good. The regulations of the steamship companies should be investigated. Most cargo from the United States must be transhipped en route. Consults of Portugal may be asked for general information regarding the colony.

Portuguese West Africa (Angola).—The consular regulations of Portugal apply. The regulations of the steamship companies should be investigated. Packing should be such as to withstand tropical climate and all hazards of transportation. Goods must be transhipped en route; landing and other local facilities are far from satisfactory. Information may be sought from consuls of Portugal.

Reunion.—The French tariff, with certain exceptions, and French consular regulations apply. Packing should be of such a nature as to withstand tropical climate and all hazards of transportation. Occasionally there is a direct steamer from New York, but ordinarily cargo is transhipped en route. The island is a French possession and information regarding it may be available at consulates of France.

Roumania.—Transportation facilities in Roumania are, in normal times, satisfactory, the railway system reaching the principal centers. Direct steamers from New York reach Constanza and Galatz, where harbors are good. The climate is temperate. The pre-war customs tariff of Roumania still applies to imports into that country. Duties on most articles are assessed on the basis of legal net weight, with specified tare allowances fixed in a schedule of tares annexed to the tariff. In view of the prevailing conditions at the present time the consular regulations and those of the steamship companies should be investigated and followed. Special or unusual forms of packing are only called for when specifically ordered by importers.

Russia.—All hazards of transportation should be guarded against, and considering the situation in Russia at present, each shipment should have its own special rules. The climate of Russia may, in a general way, be compared to that of the northern United States and Canada. In normal times port facilities and interior railway services were satisfactory, and special forms of packing only required consideration when specially ordered. Under the former Russian tariff, merchandise,

with few exceptions, was dutiable on the basis of legal net weight, with specific tare allowances fixed by a schedule annexed to the tariff.

Shippers to Russia can obtain information with regard to current conditions from the American Russian Chamber of Commerce, New York City. It must be remembered that the new states of Lithuania, Esthonia, Latvia, and the Republic of Georgia will in all probability institute their own tariffs. With respect to the Republic of Georgia it is stated that, effective March 1, 1920, the provisions of the former Russian customs tariff apply, the rate of duty having been increased ten times. The pre-war Russian tariff without additional taxation applies at the present time to goods imported into Armenia. The Republic of Azerbaijan assesses a gross tax of 5 roubles per poud (poud = 36.1128 pounds) on all classes of merchandise. The customs administration at Batum, according to latest information obtainable, applies to the pre-war Russian tariff, with an increase of 10 per cent in the rates of that tariff.

Salvador.—Transportation conditions in Salvador are exceedingly primitive and all hazards must be guarded against. The climate of Salvador is tropical. Packages may be marked with either stencil or brush and must bear consecutive numbers, but need not show weight. Duties on merchandise are levied on the basis of gross weight, hence lightness of the package is highly desirable, combined, however, with solidity and strength. There is no penalty on mixed packing, but the merchandise so packed should be properly declared. The steamship companies make certain regulations with respect to packing and marking which should be investigated and followed. There are likewise strict provisions governing the importation of pharmaceutical preparations, about which information can be obtained from the consul of Salvador, New York City.

Goods receive extremely rough handling. They are either transhipped at Panama or come in direct boats via San Francisco. In the former case there is extra

handling, with increased chance of breakage; and cargo is always very carelessly treated at the ports of Acajutla or La Libertad from the ship to the lighters. Extra protection against pilfering and extra waterproofing against exposure to sea spray and torrential rains are strongly recommended.

With reference to parcel post shipments, it is stated that only soft articles that will stand a large amount of squeezing and mashing, or goods shipped in strong wooden boxes can withstand the treatment given them in Salvador.

Siam.—There are no official restrictions with regard to shipments to Siam excepting that numbers, quantities, values, and net weight, that is, the weight of the goods excluding that of the container and of other packing, must be stated on the invoice. Some of the steamship companies require that the gross weight in pounds should be marked on packages, and these and other regulations should be carefully investigated. Packing should be of the most substantial character in order to withstand tropical climate, discharging to lighters, bad transportation conditions in the interior, and transhipment of cargo en route.

Spain.—Mild and temperate climatic conditions and good railway transportation facilities offer no hazards. There are direct steamers from the United States to a few ports; to reach others transhipment is necessary. Landing conditions are satisfactory; in most cases thoroughly modern. Duty on merchandise is, with certain exceptions, assessed on the basis of net weight, which includes the weight of the immediate packing and the container in which the goods are sold at retail. There are certain specified tare allowances fixed by the tariff. There are no official restrictions as to marks or weights, but certain regulations have been made by the various steamship companies, which should be investigated and followed.

Straits Settlements.—Consular regulations are those of the United Kingdom. The Straits Settlements is practically a free-trade colony. Goods should be packed to withstand highly tropical climate, Singapore lying only a few miles from the Equator. The regulations of the steamship companies should be investigated. Direct steamers take freight from our Atlantic and Pacific ports to Singapore and Penang. Landing by lighters is not unusually hazardous and no exceptional packing is called for, in the absence of special instructions from consignees. Consuls of Great Britain may give information regarding the Straits Settlements.

Sweden.—Neither climatic nor transportation conditions offer any special difficulties. Sweden may be compared to our own northern states or to Canada, both as to climate and as to railway and canal facilities. There are direct steamship connections with New York and port conditions are modern and good. Duty in most instances is assessed on the basis of legal net weight, which in certain specific instances includes the weight of the immediate container, and tare allowances are specified by a schedule annexed to the tariff. All goods imported into Sweden must plainly indicate the country of origin, and the markings must be of such a nature that their erasure would injure the goods. Most of the steamship companies require that gross weights in pounds must be marked on the packages.

Switzerland.—There are no official restrictions with regard to marks or weights, but certain of the steamship companies require that the gross weight in pounds appear on the packages. Climatic conditions, like our own, and transportation by excellent railway facilities offer no difficulties. Merchandise, in most instances, is subject to duty assessed on the basis of gross weight, a certain percentage being added to the dutiable weight when articles are imported without their usual containers. As Switzerland has no seaports, imports are received through Dutch, Belgian, German, French or Italian ports and railway connections.

Tripoli and Cyrenaica (Libya).—The customs duties assessed in Tripoli are ad valorem. Italian consular

regulations apply. Packing should be able to withstand hazards of hot, tropical climate and primitive landing and interior transportation. The regulations of the steamship companies should be investigated. There are no direct sailings from the United States and freight must be transhipped en route. An Italian colony; information may be secured from Italian consuls.

Tunis.—The customs tariff of Tunis assesses duties based on both gross and net weight. Consular regulations are those of France. The regulations of the steamship companies should be investigated. Packing should be such as to withstand hazards of unsatisfactory transportation and tropical climate. Transhipment is necessary in order to reach Tunis, as there is no direct steamship connection with United States ports. Information about Tunis should be sought from French consuls.

Turkey.—Packages should be able to withstand every hazard of transportation, which in many sections is primitive. Climate ranges from temperate to hot, according to locality, that of Constantinople and Smyrna being similar to that of Washington. There are no official restrictions on marks or weights, but certain of the steamship companies require that the gross weight in pounds appear upon packages. There are direct steamers from New York to the principal ports. Landing always by lighter. Political and social conditions in Turkey at present are such that each shipment should receive special investigation, but no extraordinary packing is demanded, except when special instructions may be received from importers.

Uganda.—The tariff of Uganda, a British colony, provides for ad valorem duties of 10 per cent on all but certain specified goods. Goods should be packed in such a way as to withstand tropical heat and all transportation hazards, including transhipment en route. There are no official restrictions as to marks and weights, but the regulations of the steamship companies should be investigated. Information about Uganda should be sought from British consuls.

Union of South Africa.—The tariff of the Union of South Africa assesses ad valorem duties in all but a few instances. Although terminal conditions and transportation are, in the main, satisfactory, it must be remembered that in order to reach the Union of South Africa goods must pass through the torrid zone, and due allowance must be made for this in packing. The climate of South Africa is warmly temperate. The regulations made by various steamship companies should be investigated and followed. Direct steamers from New York reach the principal ports. There are no official restrictions as to marks and weights. To comply with the terms of the anti-dumping law in force in the Union of South Africa, a special declaration is required to be appended to the commercial invoice, showing in detail, among other things, the cost of packing. Information may be obtained from British consulates.

United Kingdom.—Transportation, landing and climatic conditions of the United Kingdom are similar to those in the United States. There are numerous direct sailings, and ordinary precautions as to overseas packages suffice. There are no official restrictions with respect to weights. The United Kingdom is, in principle, a free-trade country, but many articles are dutiable. Duties are levied on coffee, chicory, playing cards, chloroform and certain other chemical products, fruit, sugar, matches, motor cars, musical instruments, spirits, including perfumery, wine and beer, confectionery, condensed milk, tea, tobacco, table waters, and shoe blacking. Most of the duties levied on these articles are specific, although there are a few ad valorem duties. The provisions of the Merchandise Marks Act governing the marking of goods imported into the United Kingdom are strict and should be investigated by the exporter to that country. The official summary of the essential provisions of this act is quoted below; further information with respect to it can be obtained from British consular officials.

"1. Foreign goods imported into the United King-

dom which do not bear any marks whatever, either on the goods themselves or on the packages or wrappers containing them, are not required to bear any qualifying statement or indication such as 'Made Abroad,' 'Made in Japan,' etc.

"2. Foreign manufactured goods bearing a name or trade mark being, or purporting to be, the name or trade mark of a manufacturer, dealer, or trader, in the United Kingdom, must have that name or trade mark accompanied by a definite indication of the country of origin of the goods. The name of the country is a sufficient indication, without the words 'Made in,' if name or trade mark only appears, e. g., 'John Smith, Holland,' would be sufficient. If such a mark as 'John Smith, Sheffield,' is used, then the qualification must be 'Made in Holland' or similar wording.

"3. If foreign imported goods bear the name of a place identical with, or a colorable imitation of, the name of a place in the United Kingdom, the name should be accompanied by the name of the country in which the place is situated. Thus, Boston, in Massachusetts, should be accompanied by the name 'United States' or by the initials 'U. S. A.'

"4. If a trade description includes the name of a place, and the goods on which it appears are not the produce of that place, or of the country in which it is situated, the trade description must be accompanied by a statement indicating the actual country of production. For instance, a wine, the produce of California, and described as 'Sherry' (which word is derived from the name of the place Xeres) should have that description accompanied by the statement 'Produced in California,' or should be described as California Sherry. An exception to this rule is made in cases where the name of a place as a trade description is indicative merely of a character of the goods, and is not calculated to mislead as the country of origin. Thus, such a description as 'Brussels Carpet' or 'Portland Cement' need not be accompanied by a statement of the country of actual production, unless as required under paragraph 2 above." Other provisions are:

"5. Trade descriptions in the English language applied to foreign goods imported for home use from non-English speaking countries, are not regarded as indications that the goods are of British or Irish origin, unless the officers have good ground for considering that such trade descriptions are specially designed to convey, and do in fact convey, an impression of British or Irish origin for the goods.

"Trade descriptions on imported goods in a foreign language, which is not that of the country from which the goods are imported, must be accompanied by a statement of the actual country of production of the goods, e. g., 'Made in Portugal.'

"6. As regards watches, any mark on the case is deemed to extend to the watch. If therefore a watch case is made in this country (United Kingdom) and bears any statement or indication of such origin (as, for instance, a British assay mark) and the watch itself is made in Switzerland, then there must appear either

(a) in close proximity to the assay mark a conspicuous statement that the watch is of foreign make; or

(b) on the dial and also on the top or bottom place of the movement, visible between the bridges, an indelible statement or indication that the watch is of Swiss origin.

"7. All qualifying statements, or indications, must be distinct, in equally conspicuous characters with, and in close proximity to, the marks they are intended to qualify.

"8. Marks on samples or patterns, whether of British or foreign manufacture, are not required to be accompanied by any qualification, provided such samples or patterns are valueless in themselves, do not form whole or complete articles, and can be readily distinguished as samples or patterns."

Uruguay.—Terminal, climatic, and interior transportation conditions offer no difficulties. The climate is

warm but temperate. It must be remembered, however, that goods shipped to Uruguay must pass through the tropical belt. Direct steamers connect New York and Montevideo.

Weights need not be marked on the packages. Marks, numbers, or other signs on packages must be clearly and legibly stamped in indelible ink. In case the markings are not clear packages will be detained at the customs house. Goods usually sold by weight or measure must be marked according to the metric system, and goods sold in pounds, bundles or sealed packages should have the net measure or weight stamped on the wrapping.

Of the articles dutiable by weight, some pay duty on gross weight, some on legal net weight, and in some instances the weight of the inner receptacle is included in the weight subject to duty. The tariff does not provide a penalty for mixed packing.

Venezuela.—Packages must be most carefully prepared to withstand all transportation hazards. There are direct steamers from New York to the principal ports. Freight is sometimes landed on wharves, sometimes by lighters. Railways connect Caracas with its port, La Guaira, and also with Valencia and Puerto Cabello. River boats tranship goods up the Orinoco (usually via Trinidad) to Ciudad Bolivar. Apart from these facilities transportation is almost wholly by muleback. However, little attention need as a rule be paid to special packing for such transport, as practically all goods for remote destinations are repacked by the large merchants in the ports. The climate varies from tropical along the coast and in the Orinoco districts to mild in Caracas and the highlands. A considerable transit trade is carried on via Maracaibo for a section of Colombia, involving difficult and primitive transport methods.

The customs tariff of Venezuela assesses duties on the basis of gross weight, and if articles subject to different rates of duty are packed in the same container, the entire shipment is subject to duty at the rate assessed on the highest taxed article so included. Great care has to be

observed in preparing all papers for Venezuela, as the customs officers are extremely exacting.

The pure food regulations of Venezuela, as well as those referring to medicines and alcoholic beverages, are stringent and should be carefully investigated.

Zanzibar.—The tariff of Zanzibar prescribes an ad valorem duty of 7½ per cent on all goods with certain specified exceptions. In the absence of regular direct steamship lines, freight is usually transhipped en route. Goods are discharged into lighters, often through a heavy surf. Packing should be sufficiently strong to withstand hazards of transportation and tropical climate, and thoroughly waterproofed. There are no official restrictions as to marks or weights, but the regulations of the steamship companies should be investigated. Information regarding Zanzibar may be sought from British consulates.

CHAPTER XI

THE PACKING OF AUTOMOBILES AND MOTOR TRUCKS

THE packing of automobiles has one angle that is not present with most classes of machinery, and that is the protection of the costly coachwork which is such an important matter, both when the machine is for resale and when the satisfaction of the customer who orders direct is at stake. Injury to the coachwork will either necessitate patching up or repainting, and there are comparatively few places, except the large cities in the countries of most advanced technical development, where this can be done satisfactorily. The coachwork of the car may be disfigured in many ways; by the car working loose in the case, by improper placing of the wheels or by so placing them that they work loose and come in contact with the coachwork, by faulty protection, and so on.

Poor adjustment of the car within the case, however, may do far more damage to the car than merely denting or scraping the body, for a car that swings inside the case is likely to break the fenders, lamps and other fragile parts. The car must also be well protected against moisture and humidity, and there should be no doubt of the perfect dryness of the case before it is shipped. A case that is not made of well-seasoned lumber or that is constructed of damp wood, will cause mold to form and produce serious damage to upholstery and top covering.

It is probable that the most important part of the automobile case is the base, and particular attention should be given to this portion of the export package. The underframe should be of very solid construction, with longitudinal beams extending the full length of the case, one on each side and one in the middle. The cross

pieces fixed to the beams should be adequate in every way to insure a perfectly rigid base when the car is fastened down. The upper structure must be strong enough to withstand a severe shock from above or from the side, and every case should be provided with skids so that the package will never rest flat on the ground. If the skids are not sufficiently high it is very probable that water will enter the case and do serious damage, but with proper skids even though water should enter along the base it would quickly drain off.

Examples of Actual Practice.—A large manufacturing company describes its export packing as follows, supplying a photograph which is reproduced on page 307. "The finished crate contains a seven-passenger touring car to be shipped to South Africa. We would call attention to the spare wheel bolted on supports above the back seat. This car was covered with cheese cloth, thoroughly protecting the entire body from dust and other like perils, and, of course, all metal parts were thoroughly coated with grease to prevent rusting or tarnishing in transit. Spark plugs are taken out and the motor itself is thoroughly greased. The plugs are wrapped in oiled paper, and the tools are also well oiled and wrapped in similar paper. The car rests on 1½" matched lumber covered with tar paper. The car is run on this bottom, the wheels taken off and secure blocking used. The framing of the case is then made, covered with tarred paper and sealed with matched lumber, and the top is covered with rubber roofing. All joints are cemented and weather stripped."

Another manufacturing company writes, in sending photographs reproduced on page 308: "For the bottom of the case we use three pieces of 3" x 6" timbers with a cross layer of 1" tongued and grooved lumber with a layer of Safepack waterproof paper, then four 1" boards are laid lengthwise, two on each side, giving a double bottom for the support of the car. The 3" x 6" timbers raise the case above the ground so that even if allowed to stand in the open and in surface water no moisture gets into the case.

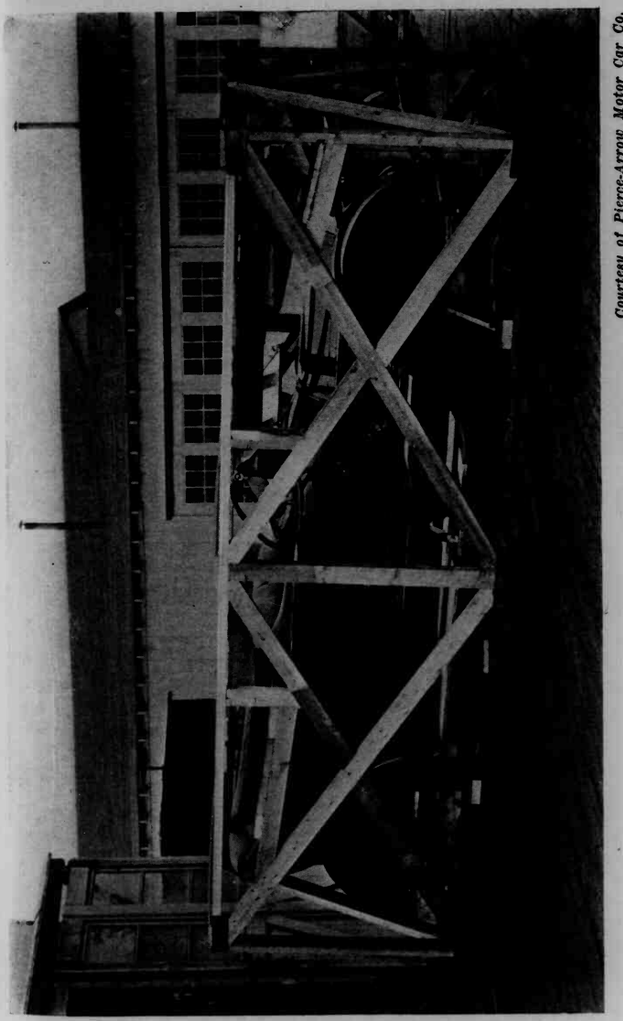
"The framework of our case is made of 2" x 4" Canadian spruce, with diagonal bracing to prevent the case from being knocked out of shape. We consider spruce greatly superior to yellow pine and N. C. pine of the same dimensions, as it is stronger and will not split when heavy nails are driven into it. The framework is covered with Safepack waterproof paper, followed by a layer of 1" tongued and grooved lumber nailed tightly together.

"The car is supported on jacks at the four hubs, and is also held down at the four hubs, besides being braced at each end. All bright parts and the motor are slushed to prevent rusting and the oxidation of nickeled parts. The top is removed and carefully wrapped in paper. The windshield is also removed and packed in a separate case, securely fastened inside of the case."

A well-known automobile manufacturing company comments as follows on photographs which it transmits and which are reproduced on pages 311 and 312: "The cases in which our cars are packed for export shipment are standardized in every detail just as are the cars which they contain. The entire case is lined with tar paper to prevent damage from water or leakage of other cargo on shipboard. The top is covered with tar paper and the entire package iron strapped. Our case measures 274 cubic feet, weighing 2,580 pounds. Attention should be called to the method of placing the windshield in a frame on the bottom of the case beneath the rear of the top.

"Partly knocked down touring cars are shipped in cases measuring 160 cubic feet and weighing 2,320 pounds. The two photographs on page 312 illustrate the packing and how the various units are placed in the case. Note that the tires are placed around the frame in order to make theft impossible without cutting the tires or tearing the case entirely apart. Unbroken paper wrapping prevents dust from accumulating and is used in addition to the tar paper."

An organization in New York which does a great deal of automobile packing for export firms supplies several



CRATING A SEVEN-PASSENGER TOURING CAR. *Courtesy of Pierce-Arrow Motor Car Co.*
Note especially how the spare wheel is bolted on supports above back seat.

INTENTIONAL SECOND EXPOSURE

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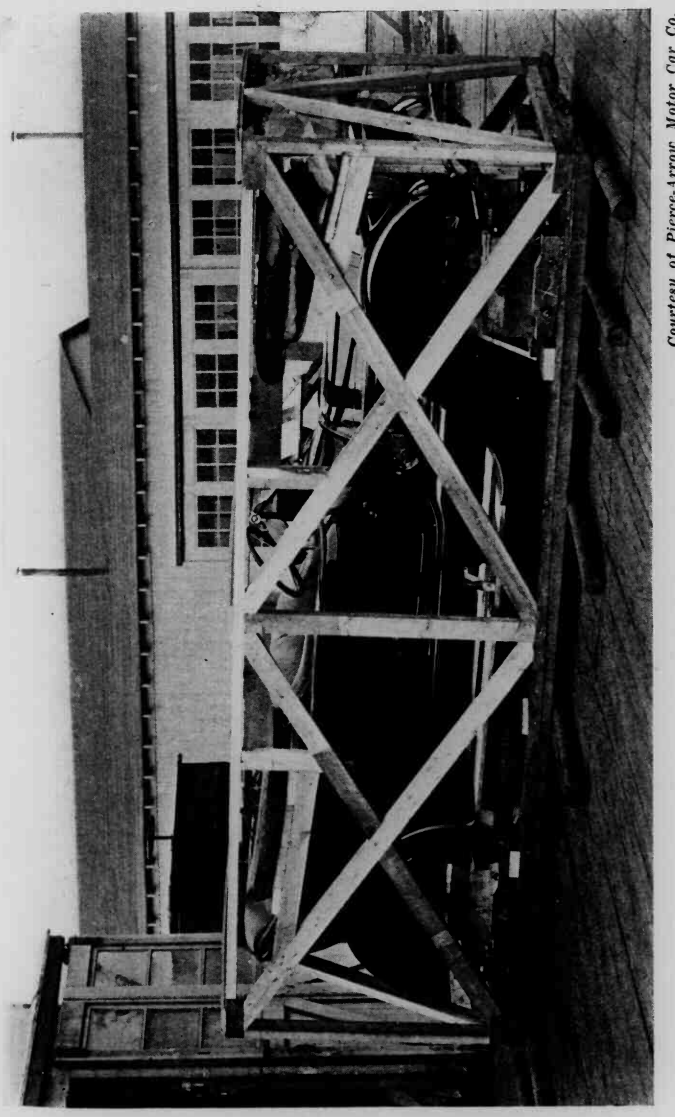
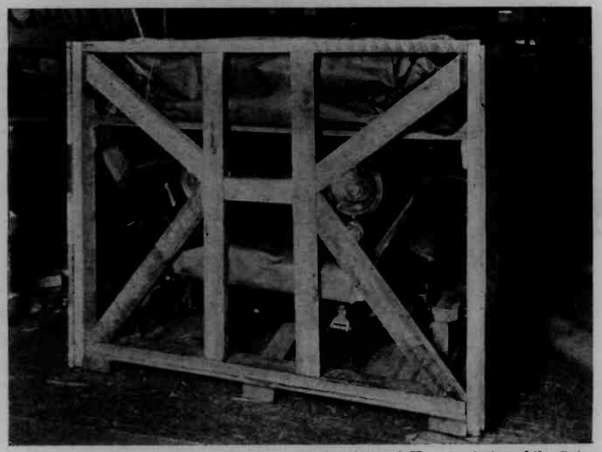


CRATING A SEVEN-PASSENGER TOURING CAR. *Courtesy of Pierce-Arrow Motor Car Co.*
Note especially how the spare wheel is bolted on supports above back seat.

Courtesy of Haynes Automobile Co.

METHOD OF BEGINNING AUTOMOBILE CASE.

Bottom of case is made of 3 pieces 3" x 6" cross layer of 1" tongued and grooved lumber, then layer of waterproof paper, finally 2 one-inch boards on each side.



Courtesy of Haynes Automobile Co.

A PARTIALLY COMPLETED CASE.

Note excellent end bracing, firmly braced jacks supporting hubs, and method of packing windshield and top.

accompanying photographs, reproduced on page 315, describing its operations as follows: "The car is first measured and a platform built slightly larger than the greatest length and width of the car. This platform is built on three 2" x 4" skids with 1" lumber nailed crosswise. The car is then moved on the platform and the wheels removed. The axles are firmly placed so that the car cannot shift in either direction. All metal parts are well greased to prevent rusting.

"Photograph shows method of securing bumper in rear; two of the wheels have been fastened to the floor of the case, the floating axle having been removed and firmly secured at right angles to the axle housing. The windshield is removed and laid on the rear seat, the cushion being turned upside down and placed on top of the shield. The top is folded down over the front seat.

"The wheels are bolted to the sides of the case, one wheel to each side and two wheels to the floor. We use a framework of 2" x 3" material, including uprights and cross beams on the roof. We think our method as shown in the photographs is excellent as preventing forward and backward movement as well as upward movement. The sides of the case are lined with waterproof paper, the sides and roof made of tongued and grooved 7/8" stuff nailed to the frame of 2" x 3" stuff placed about 4 feet apart." In this connection it is to be noted that most automobile manufacturers use considerably heavier material for uprights, corner posts, etc., as will be observed from other specifications included in this chapter.

The National Automobile Chamber of Commerce, Inc., New York City, has recently published a booklet giving the results of an investigation of export packing of automobiles. The conclusions reached are as follows:

"As the result of a careful investigation into the methods used by member automobile and truck manufacturers in packing automobiles and trucks for export shipment, your committee has to report that most of the manufacturers are working along the same lines. The methods used in the different factories are similar, and

INTENTIONAL SECOND EXPOSURE

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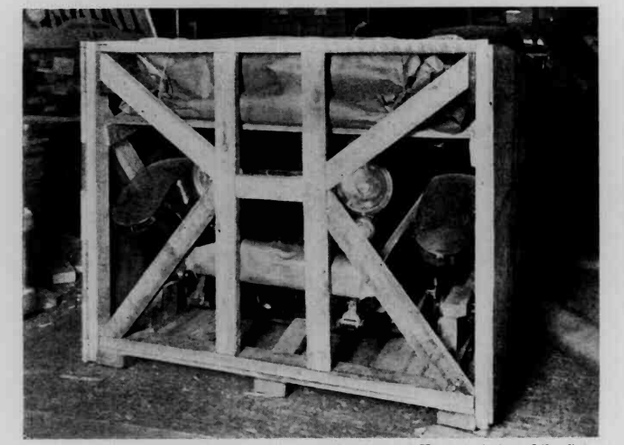

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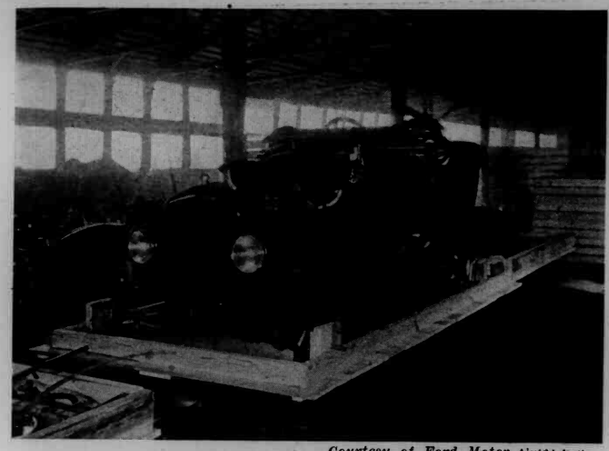
the variations consist in the way details are worked out.

"**Boxing Passenger Cars.**—On account of the scarcity of ocean space for shipping automobiles, the size of all automobile cases has been greatly decreased during the last two years. While some manufacturers have made more progress in this direction than others, the results show that considerable thought has been given by most of them to this very important matter. Due to differences in size and construction of the various cars, it is possible, in some cases, to reduce the dimensions of the packing case more than in others. The smaller cars seem to be more adaptable to the practice of disassembling in order to conserve space. No doubt the question as to how far this disassembling process should be carried has arisen a number of times, taking into consideration not only the cost of doing this work at the factory but also the facilities of the dealers to reassemble when the car is received at its destination. With a few exceptions, however, we find that the scarcity and cost of freight space have been the controlling factors.

"In our investigation we find that practically all of the different manufacturers are building good, strong, substantial packing cases. We found, however, some difference of opinion as to the size of the timber, the kind of lumber to be used, and the methods of supporting the car in the case, which affects the framework and the method of bracing. Some manufacturers are building a heavy framework of timbers to support the car independent of the lumber on the outside, the cars in this case being packed on their sides and also shipped in that manner. Cars so packed and shipped on their sides can be placed on the ordinary railroad equipment without the necessity of decking one over the other, in order to get a full carload. All cars, however, are not adaptable to this method of packing.

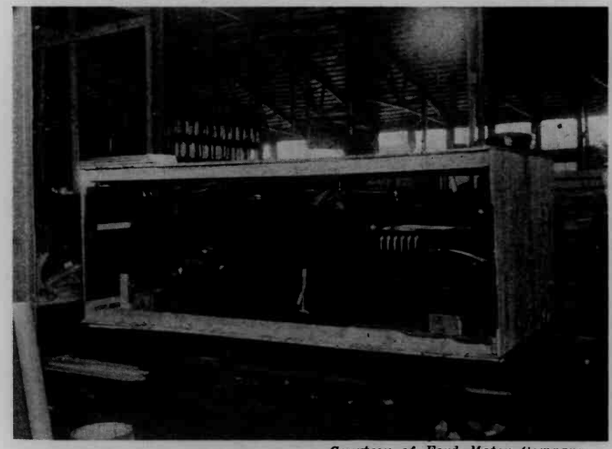
"Most of the manufacturers, however, depend upon the bottom or floor of the case as the supporting frame to carry the car. Cases of this description, however, are braced so that the cars can be carried on the side without



Courtesy of Ford Motor Company.

BEGINNING A STANDARDIZED CASE.

The completed case measures 274 cubic feet and weighs 2,580 lbs. The touring car is securely held to bottom of case by blocks through which axles are placed.



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PARTIALLY COMPLETED STANDARDIZED CASE.

Note method of placing windshield in frame beneath rear of body. Case is lined throughout with tar paper to prevent damage from water.

INTENTIONAL SECOND EXPOSURE

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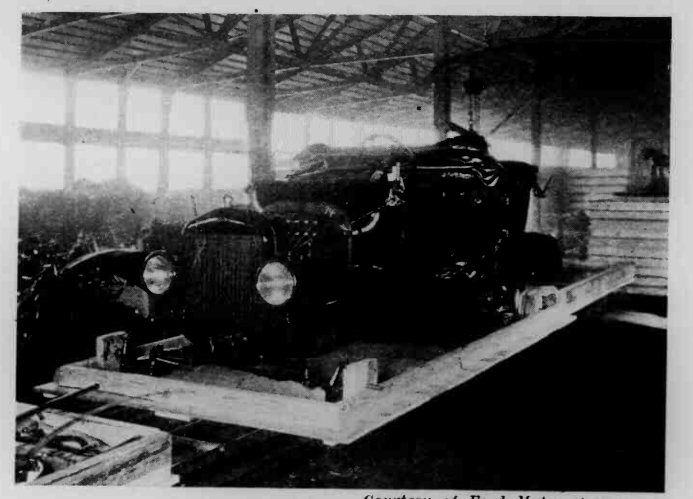

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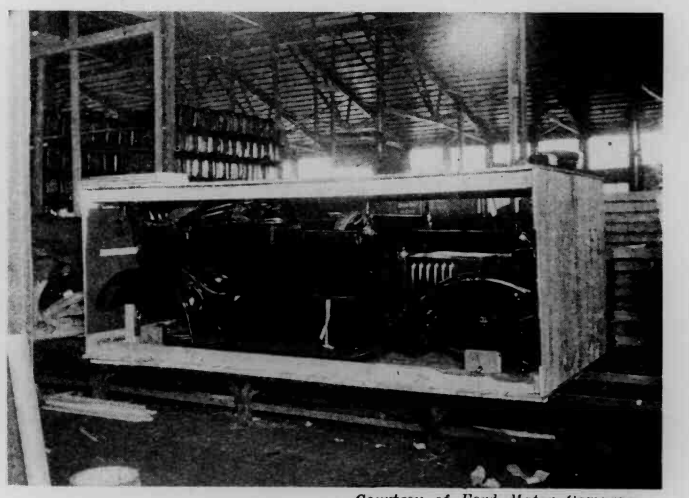

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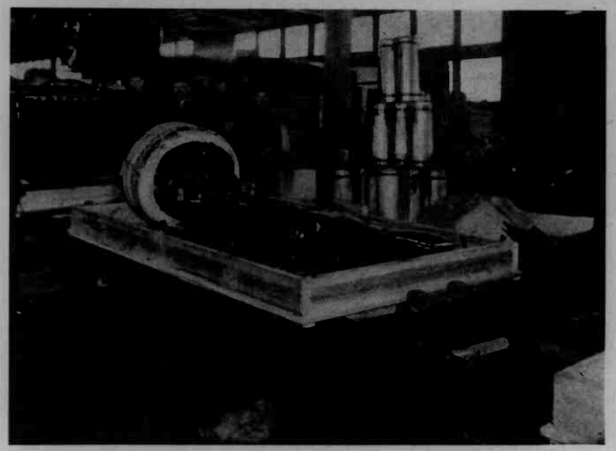
PARTIALLY COMPLETED STANDARDIZED CASE.

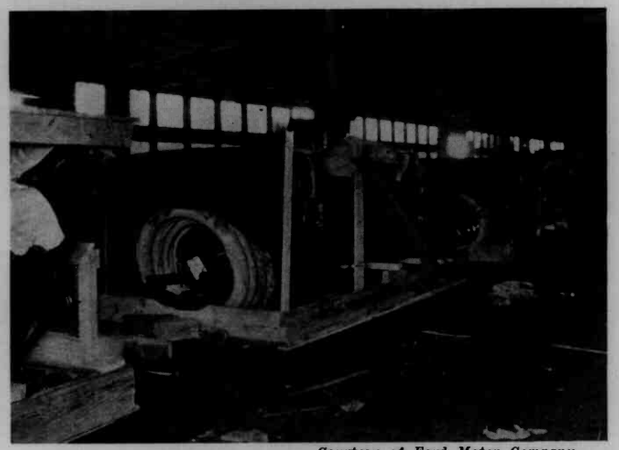
Note method of placing windshield in frame beneath rear of body. Case is lined throughout with tar paper to prevent damage from water.



Courtesy of Ford Motor Company.

CASING A PARTLY KNOCKED DOWN CAR.

Method of placing various units. Note that tires are placed around frame, making theft impossible unless tires are cut or case is torn apart.



Courtesy of Ford Motor Company.

PARTLY FINISHED CASE FOR KNOCKED DOWN CAR.

The body, top and accessories have been added to the units previously shown.

damage. The first method of packing requires much heavier timbering, and results in more dead weight on which freight must be paid.

"We found some variations in the lumber used for outside covering, both in thickness, width and kind of lumber used. Thickness varied from 7/8" to 1¼", and there seems to be a variety of kinds of wood. This, no doubt, is due to the scarcity of lumber since the war began.

"The ideal packing case is one that will carry the car from the factory to the destination without damage, and at the same time should be as light as possible and of a size to save as much freight space as possible.

"**Extent of Dismantling.**—We found one manufacturer packing five and seven-passenger touring cars by removing the front and rear fenders and running boards, packing the fenders in the tonneau of the car and wrapping each fender separately to prevent damage.

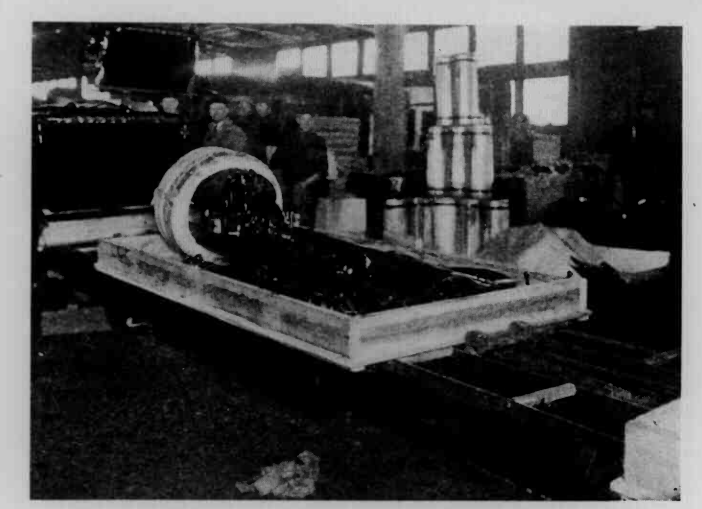
"In another instance, both the front and rear axles, in addition to the fenders and running boards, were removed.

"In some cases, however, no saving of space is accomplished by removing the axles. This depends entirely upon the design of the car, although it is the practice in some places to remove the front axle or at least the spindle and not the rear axle, as the body often projects far enough out so that removing the axle in the rear is not necessary.

"A great saving of space can be accomplished by pressing down the springs, or going still further and disconnecting the springs entirely from the frame, dropping the frame down on the rear axle housing. This also serves the purpose of keeping the car rigid and prevents any possibility of chafing.

"Another very important matter—and one that often causes a great deal of difficulty—is the proper care of the loose parts, particularly the smaller parts that are removed when the car is packed. We found that the small parts are usually packed in a cloth bag, which is attached

INTENTIONAL SECOND EXPOSURE



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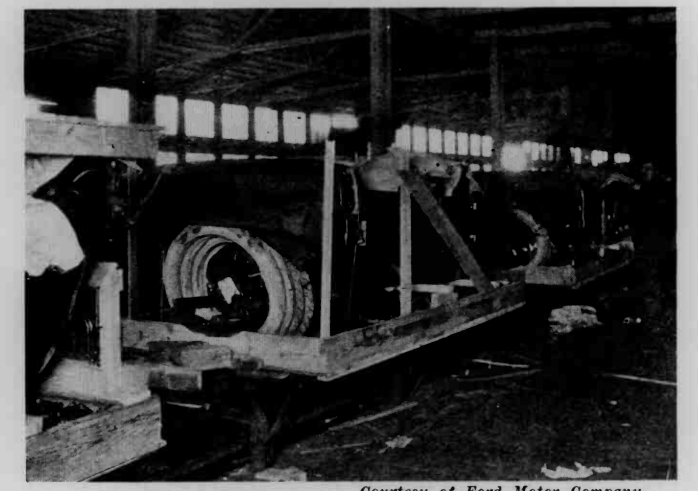

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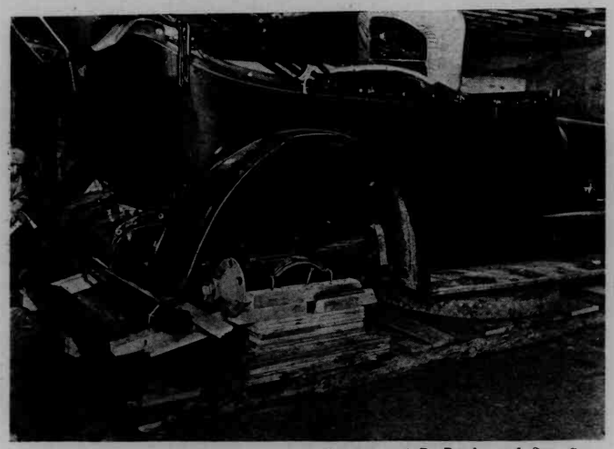
to some prominent part of the car or placed under the seat. A few extra bolts, nuts and cotter pins were usually added to replace those that might have been damaged or bent in disassembling. All loose parts, other than above, such as spare rims, wheels, fenders, etc., were found to be substantially held in position in some convenient part of the case by the use of webbing, bolts or strap iron, the top being wrapped in waterproof paper and burlap and packed in such a manner as to prevent damage from chafing or from the vibration of the case during shipment, and the windshields after removal were packed in a separate light case, which in turn was attached to the interior of the case at some convenient point, either in the end or in the top of the case.

"**Packing Chassis.**—In reference to packing chassis, still more disassembling is possible than in packing complete cars. In most cases, these units were stripped almost completely in order to obtain the greatest reduction possible in the size of the case. In several instances we found that the manufacturers were packing two chassis in one case—one chassis being attached to the bottom of the case, and the other one in a reverse position to the top of the case. This seems to be very satisfactory in some instances, particularly with the smaller cars. However, it is possible to pack chassis units separately by disassembly in less space than the combined shipment of two chassis. This, of course, depends considerably on the construction of the chassis, and, for large cars, this dual method of packing, owing to the size and weight of the case, does not seem practical.

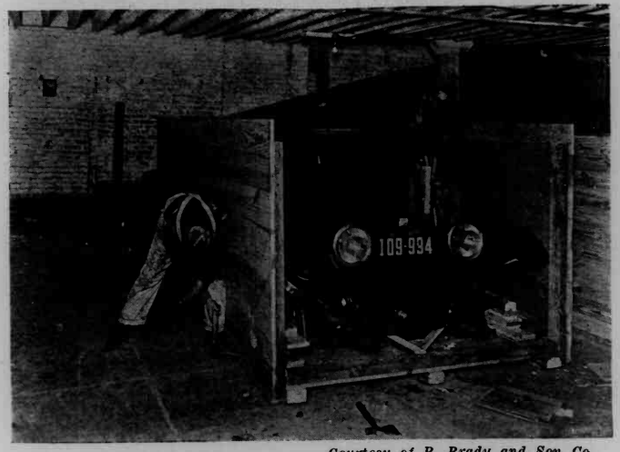
"In one plant we found that chassis were being packed in what is known as a knocked down condition on the basis of twelve chassis in one unit, the engines being packed in six cases, two engines to a case, and the frames, axles, tools, hoods, dashes, wheels, front fenders, radiators, gas tanks and miscellaneous parts being packed in separate cases. Where large shipments are to be considered, we believe that this method is very desirable, as it is the most economical method of packing, but unless



Courtesy of P. Brady and Son Co.

METHOD OF SECURING BUMPER IN REAR.

Two wheels are fastened to floor of case, floating axle is removed and secured at right angles to axle housing, windshield removed and laid on rear seat, cushion is placed upside down above windshield, and top folded down over front seat.



Courtesy of P. Brady and Son Co.

NAILING SIDE OF CASE AND ADJUSTING BRACES FOR TOP.

Note method of bolting wheels to side of case. Two wheels are similarly bolted to base.

INTENTIONAL SECOND EXPOSURE

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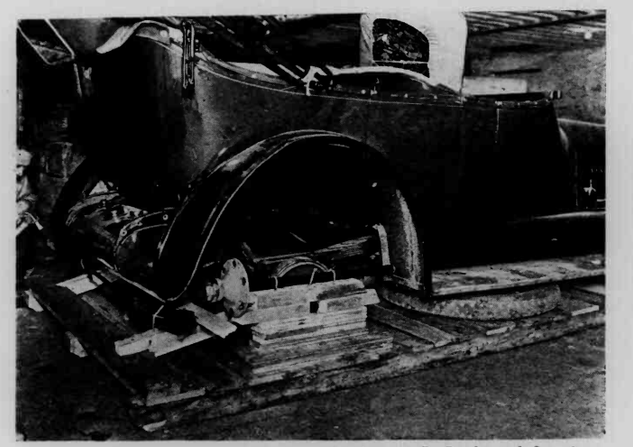

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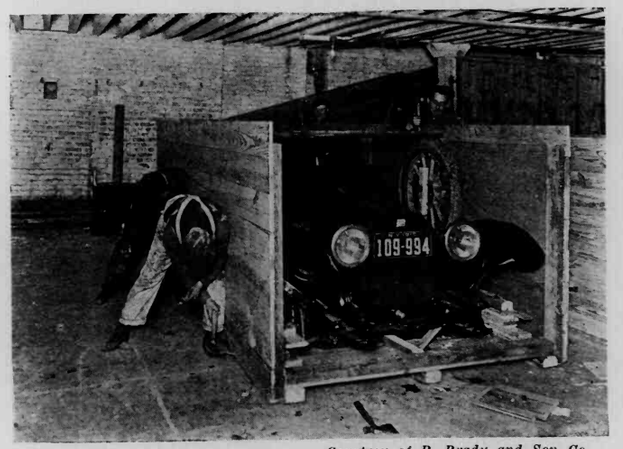

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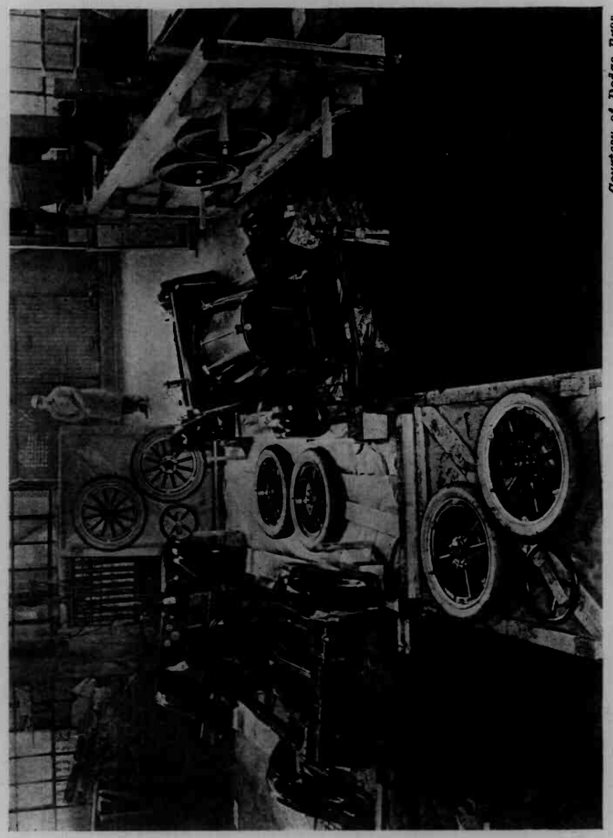


ANOTHER METHOD OF PACKING WHEELS. *Courtesy of Dodge Bros.*
Note the extent to which the car has been knocked down.

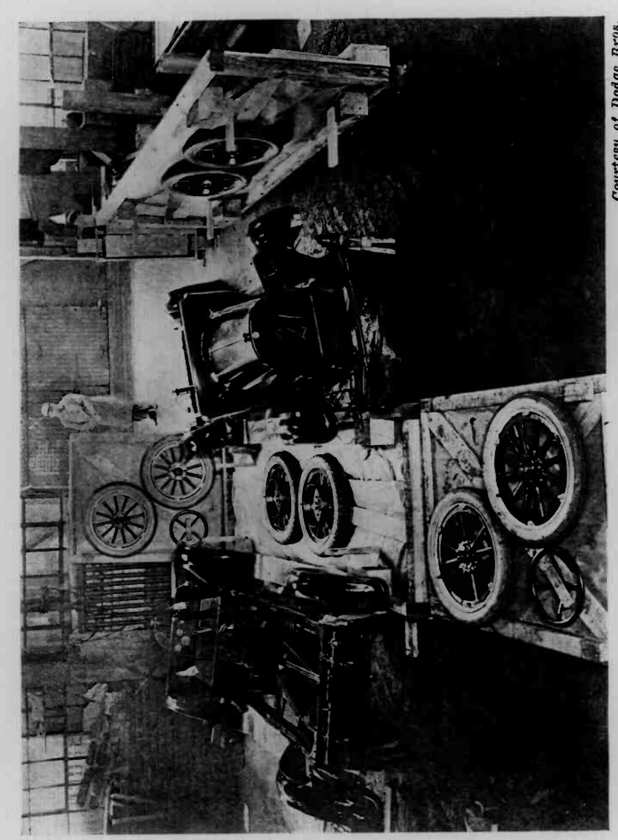
a large volume is to be considered we do not believe that it should be adopted, as entirely different facilities are required which would break up the usual routine. There is also the possibility of some part of the shipment going astray to be considered.

"**Boxing Commercial Cars.**—In packing vehicles for commercial purposes, practically the same methods are used as those followed with passenger cars, but on account of the size and weight of these vehicles, a much stronger and larger packing case is required. Timbers must be of large dimensions to carry the load that is placed upon them. The size of these vehicles makes it all the more necessary to disassemble the different parts in order to save shipping space, and we found in the factories visited that this very important matter was receiving attention. In one instance, where we found the packing being done in a very substantial and compact case, they were removing the front and rear axles and packing them lengthwise in the case, also removing the seat and placing it back of the engine. Commercial vehicles are often equipped with a driver's seat provided with a hood, which cannot be taken apart, these parts often requiring an addition of at least a cubic ton, and considerable space could be saved in working out these details, so that they could be disassembled.

"**Protection Against the Elements.**—The next important feature is the means used for protecting the cars from the action of salt water or dampness of any kind. We found that there was considerable variation in the material used for this purpose as far as the lining of the cases is concerned, and also the material and methods of applying the rust preventatives.

"Ordinary wrapping paper is being used by some for lining the case, but in most of the packing cases we found that waterproof material was being used. In addition, some place a waterproof covering over the car. The quality of this material was, of course, governed considerably by the value of the car, and as a rule this feature of lining was carried out satisfactorily. Considerable

INTENTIONAL SECOND EXPOSURE



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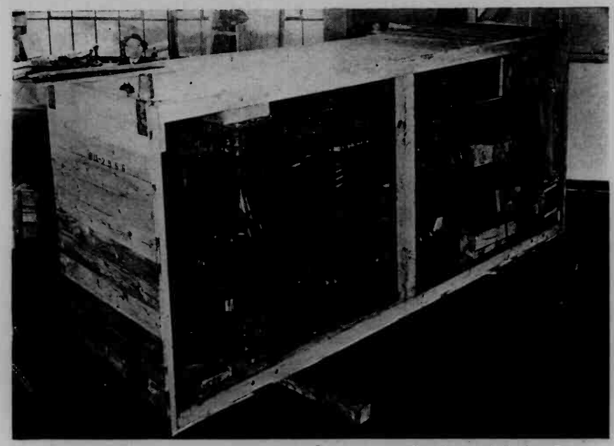
saving is possible in the selection of a material of this kind, as widths are obtainable that can be used without any cutting. This is particularly important for the top lining of the case, so that there will be no seams that might allow leakage. It is also important to select a material for this purpose that is free from any surface covering that might sift off, such as talc or sand, and injure the finish of the car. This lining should also be of such a composition as to stand considerable heat and to be free from acids or anything of that nature that might affect the finish of the car.

"**Rust Prevention.**—In regard to the different parts of the car that require greasing or protection from rust, where the production was large enough, we found a spraying system in service using a mixture of vaseline and gasoline, this material being generously applied to all parts of the chassis that might rust. This is very satisfactory, requires little time, and the material can be more thoroughly applied than by any other means, as it is possible to reach parts of the chassis that would otherwise be neglected. This greasing operation in some factories was being taken care of by the application of heavy oil or vaseline by means of a brush. This is not nearly as desirable as the spraying process, but where the production is small it can be satisfactorily worked out if care is taken to see that the work is thoroughly done.

"To prevent rusting of the cylinder walls, and the sticking of the pistons in the cylinders, most manufacturers were injecting heavy oils in liberal quantities into the cylinders. This seems to be a necessary precaution in export shipments.

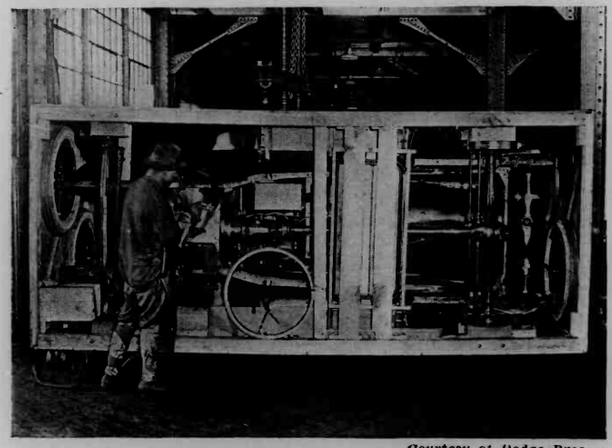
"In one place we found them using a material known as 'corol' to protect the nickel plated parts. This material can be easily applied either with a brush or spray, and forms an almost transparent film on the bright parts, drying very quickly. It is very satisfactory for this purpose, and can be easily removed with gasoline. Vaseline, however, is being used by most of the factories to protect bright parts.



Courtesy of Dodge Bros.

PACKING A CAR ON ITS SIDE.

This method obviates the necessity of decking one case over another in shipping carload lots.



Courtesy of Dodge Bros.

PROTECTING THE CHASSIS FROM RUST.

A mixture of vaseline and gasoline is sprayed on with a grease gun.

INTENTIONAL SECOND EXPOSURE

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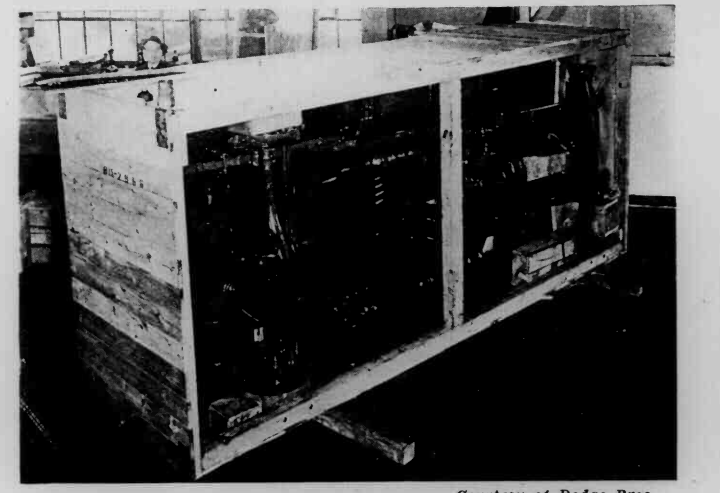

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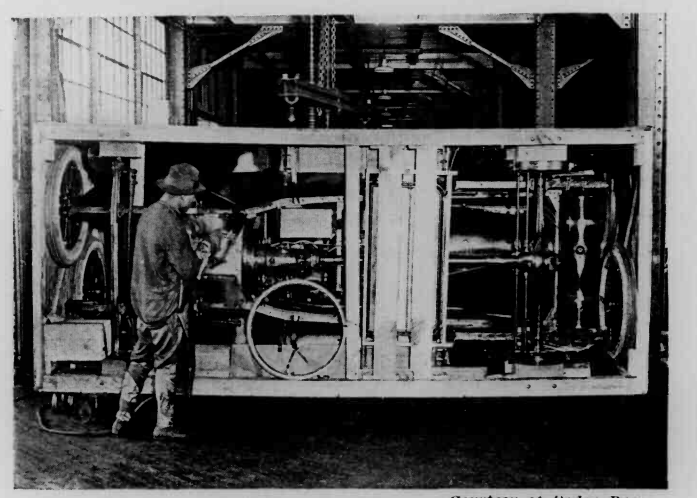

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PROTECTING THE CHASSIS FROM RUST.

A mixture of vaseline and gasoline is sprayed on with a grease gun.

Tabulated Comparison of Practices in Boxing Cars for Export

PASSENGER CARS

Wheel Base	Model	Dimensions of Case	Lumber	Frame of Car	Covering of Car	Waterproofing	Rust Preventive	Tarpaulin Used	Chassis Clamped	Chassis Lashed	Springs Blocked	Springs Lashed	Clamps	Net Weight
100	Touring 5 P	111x53x46	Miscellaneous	8x4	1" Unmatched	Ordinary Paper Lg.	Vaseline	Yes			Yes	No	Yes	157
102	"	128x60x52	Spruce N. C. Pine	8x4	⅜" Unmatched	Tar-Felt Cover	Grease	No			Yes	No	Yes	197
106	"	131x71x46	Yellow Pine	4x6 and 8x4	1" Unmatched	Tar-Felt Lining	"	No			No	No	Yes	285
108	"	132x60x40	Miscellaneous	4x6 and 8x4	⅜" Unmatched	"	"	Yes			Yes	No	Yes	259
112	"	163x70x45	Low Grade W. Pine	2x6 and 4x6	1¼" Matched	Kraft Paper Lining	Coal and Oil	No			No	No	Yes	297
113	"	163x70x45	Yellow Pine	2x6 and 4x6	"	Tar-Felt Lining	Vaseline	No			No	No	Yes	297
114	"	156x70x49	Yellow Pine	8x4 and 4x4	"	"	"	No			No	Yes	No	310
117	"	165x59x60	Miscellaneous	8x4 and 4x4	"	"	"	No			No	No	Yes	287
118	"	167x70x46	Yellow Pine	2x6 and 8x4	"	"	Grease	No			No	No	Yes	311
119	6 Cyl. Tou. 5 P.	178x55x67	"	2x6 and 8x4	1" Matched	"	Vaseline	No			Yes	Yes	Yes	366
120	Touring 7 P.	171x70x46	"	2x6 and 8x4	⅜" Matched	"	"	No			No	Yes	Yes	339
124	"	178x70x53	"	2x6 and 8x4	1" Matched	"	"	No			No	Yes	Yes	403
125	6 Cyl. Tou. 7 P.	181x68x67	"	2x6 and 8x4	"	"	"	No			Yes	Yes	Yes	390
100	Chassis	"	"	"	"	"	"	Yes		1	"	"	"	718
102	"	104x55x31	Miscellaneous	8x4	⅜" Matched	Tar-Felt Cover	Vaseline	Yes	No	No	Yes	No	Yes	84
106	"	147x64x30	Spruce N. C. Pine	4x4 and 8x4	1" Matched	Tar-Felt Lining	Grease	No	No	No	Yes	No	Yes	163
108	"	124x66x47	Miscellaneous	4x4 and 8x4	⅜" Matched	"	"	Yes	Yes	No	Yes	No	Yes	207
112	"	"	Low Grade W. Pine	8x4	1¼" Matched	Kraft Paper Lining	Coal and Oil	"	Yes	No	No	No	No	"
113	"	139x48x25	Yellow Pine	8x4	⅜" Matched	Tar-Felt Cover	Vaseline	Yes	No	No	Yes	No	Yes	110
114	"	161x70x60	Miscellaneous	8x4 and 4x4	"	Tar-Felt Lining	"	No	Yes	No	Yes	No	Yes	209
118	"	165x59x31	Yellow Pine	2x6 and 8x4	"	"	"	No	Yes	No	No	No	Yes	173
125	"	179x72x53	"	2x6 and 8x4	1" Unmatched	"	"	Yes	Yes	No	Yes	No	Yes	293

TRUCKS

Wheel Base	Model	Dimensions of Case	Lumber	Frame of Car	Covering of Car	Waterproofing	Rust Preventive	Tarpaulin Used	Chassis Clamped	Chassis Lashed	Springs Blocked	Springs Lashed	Clamps	Net Weight
132	Chas.	195x70x64	Yellow Pine	8x4	1" Matched	Tar-Felt Covering	Grease	Yes	Yes	...	...	...	No Seal Only	906
138	"	197x54x54	"	8x4	"	"	"	Yes	Yes	...	...	...	Yes	981
142	"	1	...	...	...	...	Heavy Oil	Yes	Yes	...	...	...	No	817
144	"	215x58x48	Hardwood	4	...	Tar-Felt Lining	Heavy Grease	Yes	Yes	...	...	...	Seal Only	824
144	"	225x58x78	Yellow Pine	2x6 and 8x4	1" Matched	Tar-Felt Covering	Grease	Yes	Yes	...	...	...	"	333
154	"	244x70x40	"	...	"	"	"	Yes	Yes	...	...	...	"	498
163	"	244x70x44	Yellow Pine	...	1" Matched	Tar-Felt Covering	Grease	Yes	Yes	...	...	...	"	498
167	"	292x66x67	"	...	"	"	"	Yes	Yes	...	...	...	"	586

*32 Motors in 6 Cases, 16 Chassis in 10 Cases. †16 Chassis to each shipment. ‡Length 164". Width 59". Height 46". §1" Dbl. Tongue and Gr.

NOTE—Wheels, Top and Windshield removed from all the above cars.

Courtesy of National Automobile Chamber of Commerce, Inc.

"Band Iron.—To strengthen the cases and also to prevent pilfering, band iron is used by most of the factories. Several had gone to great pains to prevent theft by using continuous bands of this material around all the joints of the case. There was considerable variation in the gauge of steel used, but the best results seem to be obtained by those using an annealed No. 22 gauge band iron one inch wide. This material was soft enough to allow nails to be driven through it, but had the necessary strength to allow for tightening.

"Stenciling.—A very important detail in boxing motor cars for overseas is the use of proper stencils, as regards size of the letters and figures used, and also having all the information required by our export customers placed in a uniform manner on the cases.

"Letters and figures at least 1¼" high, showing the weights in pounds and kilos and dimensions of the case in inches, should be placed on four sides of the case. The customer's mark and case number should also be shown on four sides of the case in at least 1¼" letters. (This is the longest letter obtainable at present from the standard stencil cutting machines.) It is advisable to place these stencils on the case in some regular manner, and good, clear stencils can be obtained by using stenciling inks that are obtainable for this purpose.

"Larger size stencils are very acceptable if available, but in handling a large production a stencil cutting machine is a necessity, and so far the size of the letters and numerals that can be cut with these machines has been limited to two small sizes, ¾" and 1¼".

"To prevent the stencils becoming indistinct due to weather effects on the lumber, shellac can be used to cover that part of the case, thus preserving the stenciled inscription so that it is clear and distinct at the destination of the case.

"Lumber.—In tabulating the information we have obtained on the boxing methods used on twenty-two different touring car models and chassis, we found that yellow pine was most used for the lumber of the case,

nine using yellow pine, two spruce, two a low grade of white pine, and two North Carolina pine; the rest used a variety of materials. In the size of timbers used for the framework and packing of the cases, seven were made up of 2″ x 6″ and 2″ x 4″; six of 2″ x 4″ and 4″ x 4″; five of 2″ x 4″; one of 2″ x 6″; one of 2″ x 6″ and 2″ x 8″; one of 4″ x 6″ and 2″ x 4″; one 2″ x 6″ and 4″ x 4″. In reference to the thickness of the lumber used for the outside of the case, the most were using ⅞″ matched lumber; thirteen were using this thickness; two 1¼″ matched; four 1″ matched, and three 1″ unmatched lumber.

"**Further Analysis of Methods.**—As to the lining of the case, we learned that all cases except three were being lined completely, the few exceptions using a lining in the top of the case only. Nineteen were using tar felt roofing material, two kraft paper and one ordinary wrapping paper.

"In the extent of disassembling, we found that all removed wheels, top and windshield and seven plants also removed the axles. By twelve the fenders were being removed. The seven that had removed the axles also had removed fenders and there were in addition five others who were removing fenders who did not take off the axles.

"The practice of depressing the springs to cut down the size of the case was followed by the majority and some disconnected the shackles, allowing the frame to come down as low as possible. One removed the rear springs entirely.

"Only three packed the cars on the side; all others packed the cars on the bottom of the case.

"Among the methods used in packing chassis, there were three where two chassis were packed in one case. In one factory, the chassis was completely disassembled, and the different units packed in separate cases. As this report covered nine different chassis, the majority therefore are still packing chassis singly. In each instance, however, the chassis were disassembled to a considerable extent, and in at least three instances referred to chassis were almost completely disassembled.

"In regard to the protection of cars from damage due to dampness or exposure to salt water, it is the universal practice to inject heavy oil in the cylinder. In one plant, however, we found that this had not been done recently, and that no trouble had been reported. The use of grease or vaseline was also recognized as being absolutely necessary, and in several factories we found the chassis parts were being still further protected by a spraying process, using vaseline diluted with gasoline.

"**Tabulated Data.**—Reference to the table, page 320, showing the wheelbase, type of car, the dimensions of the case and the number of cubic feet will bring out some interesting data by comparing one car with another.

"In regard to packing trucks, all those considered were without bodies, yellow pine and hardwood being used about equally, the outside lumber being 1″ and the timbering for the framework varying according to the size of the chassis. The tar felt roofing material was being used almost exclusively to line the cases, heavy grease was being used for rust prevention and all protected the cylinders by heavy oil. In each instance, the axles had been removed, as well as a number of other parts such as the radiator, steering gear and smaller parts."

Marking of Trucks.—The High Commission of a European government, from its New York office, submits the following: "Regarding marking of cases containing automobile trucks, letters and figures 12 inches in height have frequently been used, although we believe that clean cut letters and figures of 6″ or even 3″ will serve every purpose. On boxes containing spare parts the smallest letters and figures used for marking should not be less than 2″ high."

CHAPTER XII

SHRINKING THE PACKAGE

IT is true that progressive exporters were aware of the necessity of shrinking or reducing the export packages even before the war, but the imperative command to do this came to us during the great struggle when a minimum of shipping space was available for a maximum of goods. The Government took the leading part in this work, but the efforts of the authorities were splendidly supported by the rank and file of manufacturers, with the result that more practical and workable data were obtained during this brief period than would probably have been obtained in peace times in many years.

Like any other industrial or scientific problem, export packing may be reduced to comparatively few fundamentals, and these fundamentals I believe are essentially the preservation of the goods, economy in the duties and economy in weight and space. To repeat this statement in another form, we may say that on the packing depends the arrival of the merchandise in good shape, the amount of rail and ocean freights charged for the transportation and in many cases the amount of duties that will be assessed at the port of entry. When one considers just how much is at stake, the subject is one that merits and demands the closest study, for the satisfaction of the customer absolutely depends on fulfilling these requirements and on the satisfaction of the customer depends the continuance of business relations and consequently the continuance of the export trade.

The War Department saved millions of dollars by decreasing the displacement of ocean shipments during the war and we believe that this saving is going to be duplicated in the future in the export packing of pro-

gressive American manufacturers. As a rule, ocean freight rates are calculated on the amount of space occupied by the cargo and the reduction of displacement will not only result in reducing freight rates, but will mean saving in freight car space, in storage space, in handling costs and in many cases in the cost of the package itself. Moreover, as duties are frequently levied on gross weight the reduction in size of the package will mean a reduction in the cost of entering the goods.

The work done by the Government during the war will doubtless remain a standard for many years to come, and it is a standard that should be kept constantly in mind by the exporter who really means to develop an export business. The men working for the different military branches during the war succeeded in reducing the space occupied by a five-ton truck from 1,100 cubic feet to 260 cubic feet; camp kitchens were crated so as to carry in the open spaces food supplies and kitchen utensils; bales were so designed that the burlap cut to the exact size of a sand bag and could be so used after the goods had been unpacked; lathes, drill presses and other equipment were reduced so that a saving was made of many cubic feet on each shipment, and the same was true for gun-carriages, airplanes, ration-carts, and so forth. The same story could be told for practically all commodities shipped abroad by the Government during this time and the work accomplished will be of incalculable value in the future to international American trade.

How Shrinking May be Accomplished.—A package may be shrunk or reduced by the more compact packing of the contents of the package and by the re-designing of the container itself, thereby reducing the exterior dimensions. It would probably be difficult to state exactly whether greater savings have been made by re-designing the package or by changing the disposition of the contents in the package, but it is probable that in almost every case something of the two principles entered and will enter into every satisfactory export

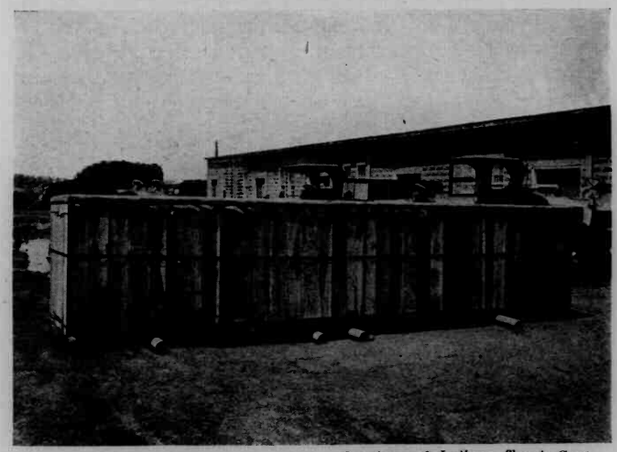
package. There is still another method by which the package may be reduced and that is by striving to reduce the space occupied by the individual items of the package and in many cases a surprising saving can be made. In a recent issue of *Commerce Reports* the case is cited of an English shipment of chemical tabloids which were packed in lots of 25 tabloids in a very large bottle, the empty space in the bottle being filled with raw cotton. According to the report in this case, the same sized bottle could have held 50 tabloids and still leave sufficient space for the absorbent cotton, and as the duties were levied according to the weight of bottle and packing there was an appreciable saving that could well have been taken advantage of by a competitor, since the laid-down cost of a full bottle would have been less. In this case a further advantage of the full bottle would have been that possible surreptitious extraction of the tabloids by dishonest druggists would have been largely avoided.

One of the most common errors in packing is the failure to utilize the waste spaces which are created by the character or form of the contents, for example, filling the "hole in the doughnut" of the rubber tires with cartons containing tubes. Waste of space may also be occasioned by using containers which do not fit the case, and this almost always results from the slovenly practice of trying to make a one-sized case do for a number of commodities. Fortunately there is plenty of good practice in this particular, and in the commodity chapters of this book more than one manufacturer has spoken of the different cases used for different classes of goods. If any manufacturer thinks he is saving money by using the same sized case for all of his line, let him consider all the costs that directly result from this practice and the tiny comparative saving that results from the use of a one-sized case.

A long series of experiments should be carried on with the contents of cases before the final arrangement is decided on, and every possible arrangement should be tried out before the standard case is designed. Remark-

Courtesy of Indiana Truck Corp.

METHOD OF PACKING DISASSEMBLED TRUCKS.
For specifications of cases, see text.



Courtesy of Indiana Truck Corp.

COMPLETED CASE CONTAINING DISASSEMBLED TRUCK.
This case shows the results of "shrinking the package."

INTENTIONAL SECOND EXPOSURE

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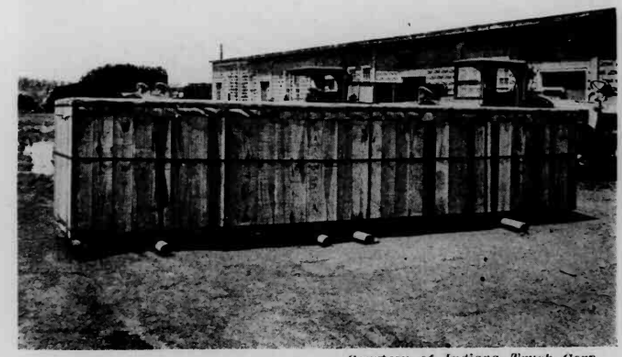

Courtesy of Indiana Truck Corp.

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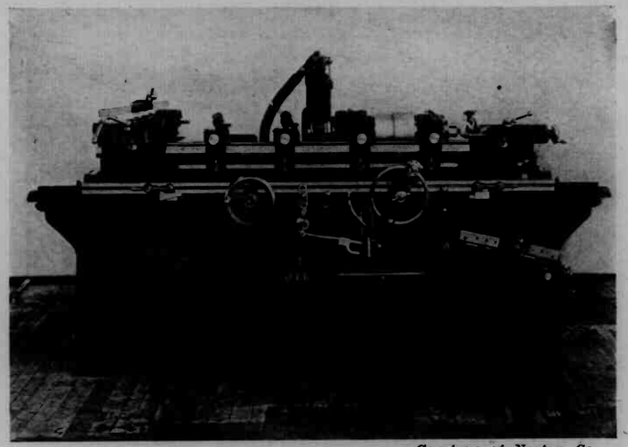
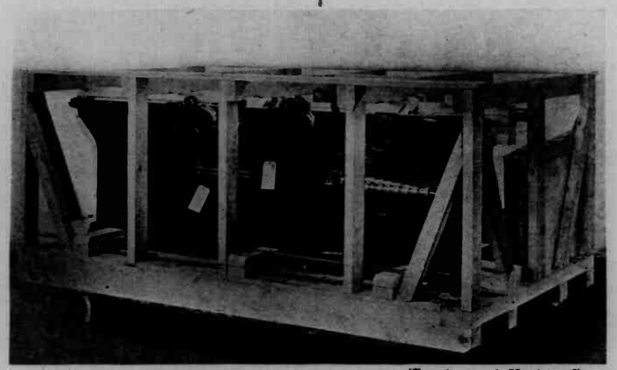


Courtesy of Norton Co.

CYLINDRICAL GRINDING MACHINE ASSEMBLED.

Comparison of the cubic contents of this machine with that of the boxes in complete shipment makes evident the extent to which the machine has been stripped and the care with which it is packed.



Courtesy of Norton Co.

METHOD OF CONSTRUCTING BOX.

Note the excellent construction of the framework of the box. To a man experienced in export packing this picture tells the whole story of careful packing.

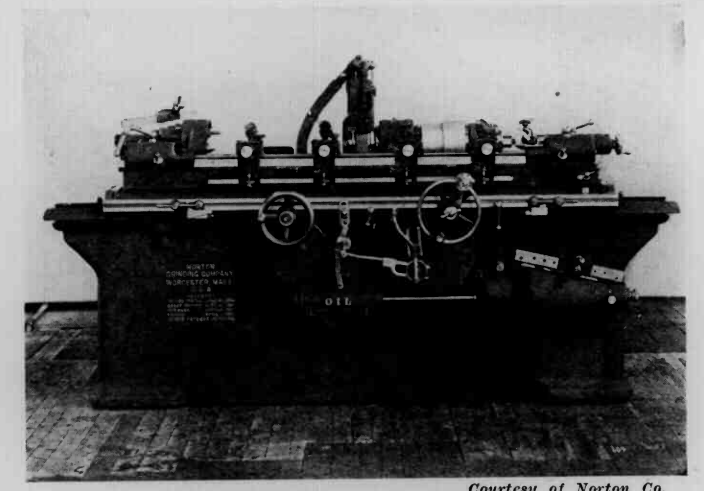
able things were done by the Government and the Forest Products Laboratory in this work, and in the chapter on the Forest Products Laboratory we have mentioned a few of the things accomplished, such, for example, as the reduction of the case for the Browning automatic rifle.

Displacement may be reduced in other ways. For example, cleats may be put on the inside of the cases instead of on the outside where the contents are of an irregular size and there are open spaces which make room for the cleats, and this is also true for battens that are placed around the middle of cases. In other packages steel strapping will be found equally strong as battens and the removal of the battens from the case will effect quite an economy in space.

It is probable that more waste takes place in the case of crates than in that of cases, for frequently the crate seems to be built up without any particular plan in view, the idea being to crate the piece of machinery or other commodity and to build up the crate according to the more or less capricious form of the goods to be packed. It will be found, however, in this case as in others that experimenting will do a great deal toward reducing displacement. Space can be saved by proper designing of the corner joints, by proper placing of the braces and so on.

Another important saving in displacement is the result of the use of the proper woods, and this question of wood strength cannot be given too great study by the packer. In the chapter on the Forest Products Laboratory there are several graphs that give quite exhaustive information on the subject of different woods, but the writer would not advise anyone to take the information given in that chapter as final. New experiments are constantly being made at the Laboratory and the progressive packing room should keep in close touch with these experiments. However, the point of this paragraph is that important savings may be effected by using, for example, a hardwood instead of a soft wood,

INTENTIONAL SECOND EXPOSURE



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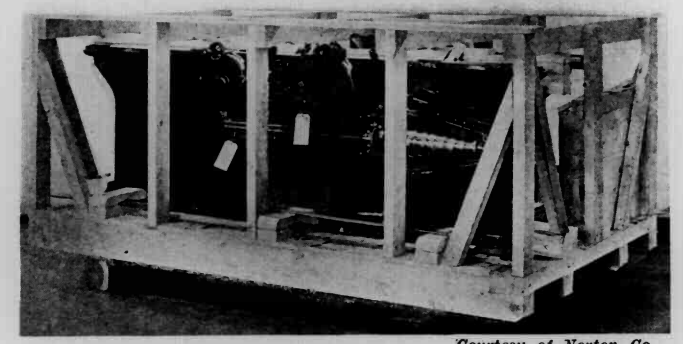

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as the former permits the use of a thinner wood than is the case for the soft wood, and this all means a saving in displacement. I know of one concern that is now saving from three to four cubic feet per crate, the direct result of changing the slats in the case from pine to oak.

Important savings in space may also be made by the use of steel strapping, corner irons and other metal fastenings which will permit the use of a thinner wood. It was found by the Government that a box made of one-quarter inch lumber properly strapped would stand up as well as a box made of one inch lumber with no straps. Likewise there is the saving that may be obtained by shipping goods unpacked when such is possible. Large machinery particularly can frequently be shipped with absolute safety without packing, and in Chapter XXIV we show a locomotive shipment where the machine is shipped without disassembling and practically without packing.

A large manufacturer of motor trucks submits photographs on page 327 illustrating its own practice in "shrinking" the package. This company ships its trucks of varying capacity in cases as follows:

Capacity	*Net Weight*	*Gross Weight*	*Dimensions*	*Cubic Feet*
1¼ ton	3,582	5,030	45″ x 45″ x 16'9″	220
2 "	4,850	6,412	48″ x 45″ x 18'3″	275
2½ "	5,113	6,675	48″ x 45″ x 19'3″	28)
3½ "	6,320	8,170	48″ x 45″ x 20'3″	304
5 "	8,100	10,250	51″ x 48″ x 21'9″	370

The smallest chassis, 1¼-ton, is boxed on two sills 4″x6″, forming the bottom of the crate, which is securely bolted and anchored. For the chassis of the 2 and 2½-ton trucks, 4″x8″ sills are used, and for the chassis of the larger sizes, 3½ and 5-ton trucks, 4″x10″. Tongued and grooved matched lumber is used for top, bottom and sides, running up and down and crosswise, not lengthwise. For the platform of all chassis 1¼″ material, dressed on one side, is used. About 5 lbs. of No. 12-penny common nails are required for each platform. For the top of crates for all chassis matched or ship lap

lumber is used, the braces being of ⅞″x6″ stuff. About 3 lbs. of 6-penny common nails and about 2½ lbs. of 8-penny common nails are used for one top. The sides of crates for all models are made of ⅞″ matched material, the top tie being of 1½″x3″ stuff, the bottom tie of ⅞″x6″ stuff and the braces of ⅞″x6″ lumber. About 3 lbs. of 6-penny common nails are used for each side, or 6 lbs. for each crate; about 1 lb. 8-penny common nails are used for each side, or 2 lbs. for each crate. The ends of crates for all models are made of ⅞″ matched or ship lap lumber. The top tie is made of 1½″x3″ stuff, the bottom tie of ⅞″x6″, and the braces of ⅞″x6″. About ½ lb. of 6-penny common nails are used for each end, or 1 lb. for each crate; about ½ lb. of 8-penny common nails are used for each end or about 1 lb. for each crate.

CHAPTER XIII

THE PACKING OF MACHINERY

THE American machinery industry, with justice, is and has been considered one of the great as well as one of the model trades of the world, and while the volume of export business during the war was immense, the industry by no means owes its development or its present position to war demand and urgency. The great machine tool manufacturers of this country, for example, have always occupied a high position in the technical trades of the whole world and the fact that more than $58,507,942 worth of this sort of machinery was exported in 1919 is merely a recognition of merit. It is interesting to note that in many cases where tools were made for foreign governments under the most rigid specifications, the work turned out produced the highest commendation from the inspectors. The general subject of the packing of machinery for export has already been thoroughly treated by a recognized authority of the highest standing and most comprehensive experience, in the special chapter of this volume by Mr. M. C. Fitz Gerald, Manager of Transportation of the General Electric Company. It only remains in this chapter to quote supplementary suggestions from letters and instructions issued by other authorities, and to illustrate the best practice in packing machinery by some large and successful exporters.

Disassembling Machines.—Much displacement, meaning reduction in cubic space and consequent charges, was saved by the United States Government in its packing of machinery for export during the war, and is today being saved by manufacturers, through the partial or complete disassembling of the contents of cases. But

disassembling must be most carefully considered. In the case of simple machinery, the reassembling of which requires no particular technical skill, there should be no hesitancy in taking the machine down and packing it in the smallest possible space, but in the case of very complicated machines that require an expert mechanic for their reassembling, the manufacturer must carefully consider what facilities are present for taking care of the reassembling problem at the point of destination. In the case of costly machinery it is frequently the practice to have the customer pay the erecting costs, and these erecting costs may include the sending of a mechanic from the United States to do the work, the customer paying all expenses. In many instances, however, carefully worked out instruction sheets will take care of the problem, but these instruction sheets should be in the language of the customer and most carefully translated by a man knowing technically the particular machine. It is always possible to have good photographs taken of the process of assembling the machine and these should always accompany the instruction sheets. However, in considering the subject of disassembling machinery it is always well to remember that the knocking down process and shipment of a dismantled machine may sometimes cause more trouble and expense in assembling than the actual saving in freight amounts to.

The specifications for packing of the General Engineer Depot of the War Department contain the following paragraphs:

"Machines will preferably be shipped complete when weight and space occupied are not objectionable. Small and fragile parts will generally be demounted and packed with proper care, in a compartment built into the large case. Other small detached parts should be bolted or securely fixed to the cross bars or supports, if not packed in a compartment of the main box.

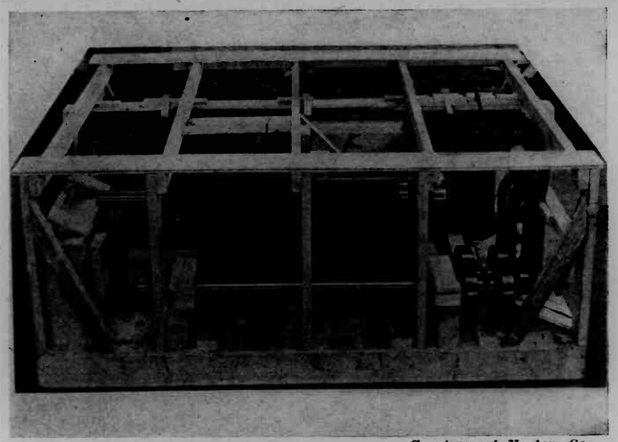
"When machinery is knocked down, dismantled parts will be marked with a number of ample size and easily seen. Bolts and screws will be greased and put back

into their proper places. Each key will be taped in the key seat. Uncovered oil holes and tapped holes will be filled with pine plugs driven in to exclude dirt."

An English authority offers the following: "Erecting troubles often come from corresponding parts of the right and left hand sides of the machine being interchangeable. This can be prevented by adding the letter 'L' or 'X' on left hand pieces. A paint should be used that will easily wash off after erection. White lead and turpentine are very satisfactory."

To what extent a machine should be dismounted depends chiefly on the character of the machine and its destination. In a general way, where any comparatively fragile part stands out from a more solid mass it should be dismounted and packed separately. Where light open framework gives a machine great bulk with comparatively little weight, it should be taken apart and the various pieces packed flat. Fragile parts and accessories should be dismounted, greased, wrapped in oiled paper and tucked securely away in the body of the machine. All polished parts of the framework should be greased and machined parts wrapped with two or three layers of straw rope, when comparatively rough machines for short journeys are shipped without box, as is sometimes done. In taking a machine apart, the packer should always keep in mind continually the question of how it shall be reassembled. Bolts and set screws should, whenever possible, be put back into the places where they belong, each key should be kept to its own wheel, but as it is impossible to tie a key securely, a wooden plug should be driven tight into the bore and the key driven into the plug; or the key may be put in a canvas bag and attached to the shaft or wheel. Uncovered oil holes and tapped holes should be fitted with a wooden peg to keep out dirt and where shafts enter bearings a few strands of yarn should be wrapped around the shaft for the same purpose.

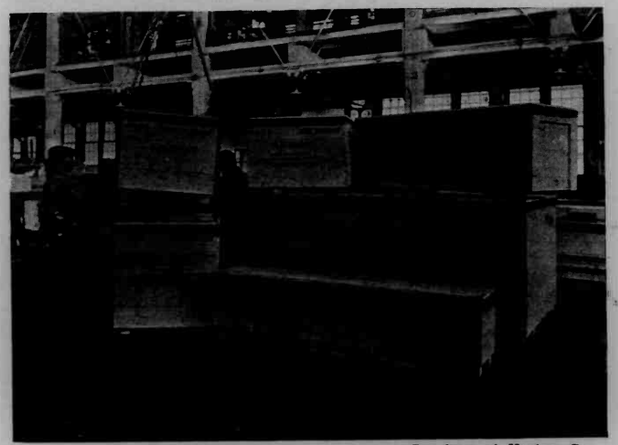
A large export firm on our Pacific Coast issues a circular to makers of machines whose products it may



Courtesy of Norton Co.

HOW THE MACHINE IS HELD IN PLACE.

This picture is taken from a position slightly above the machine and illustrates the method of holding it in place in the box.



Courtesy of Norton Co.

THE DISASSEMBLED MACHINE IN COMPLETE SHIPMENT.

The entire shipment ready to be placed aboard cars. In this picture the method of marking is also plainly shown.

INTENTIONAL SECOND EXPOSURE

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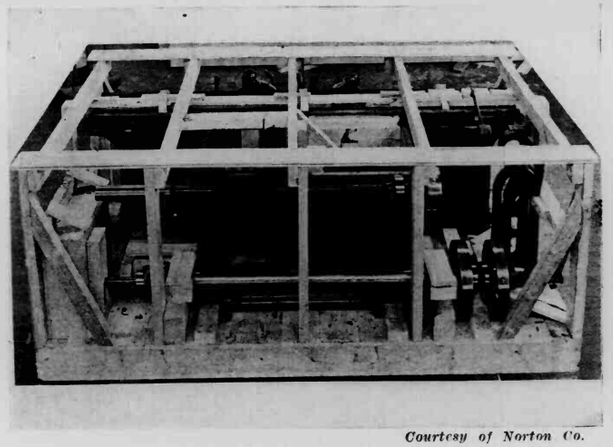

Courtesy of Norton Co.

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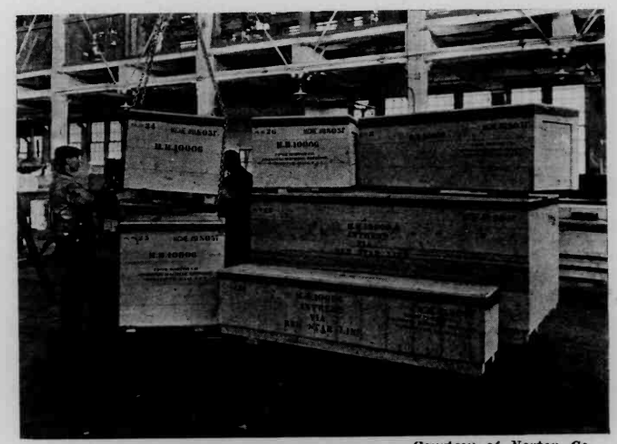
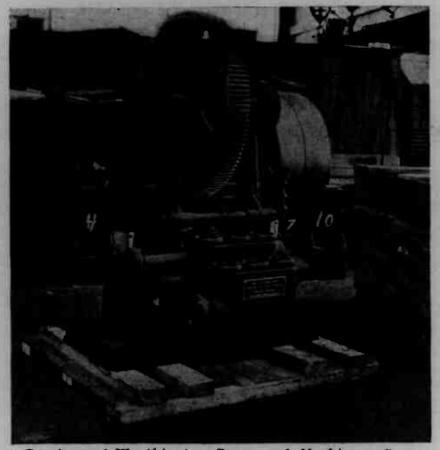


Courtesy of Norton Co.

The Disassembled Machine in Complete Shipment.

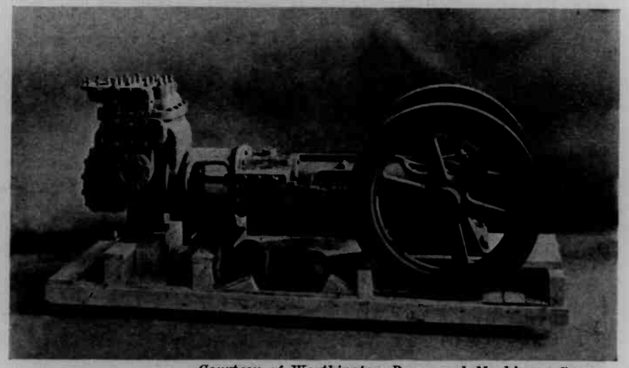
The entire shipment ready to be placed aboard cars. In this picture the method of marking is also plainly shown.



Courtesy of Worthington Pump and Machinery Corp.

PACKING A POWER PUMP.

Vertical triplex power pump set on 3" x 6" spruce timbers for skidding. The cross brace is of the same material and size.



Courtesy of Worthington Pump and Machinery Corp.

MOUNTING THE PUMP ON PLATFORM.

The pump is mounted on skids with proper blocking underneath, ready for framing and boxing. Platform is of very rigid construction. Note that discharge air chamber has been removed from pump and is bolted and blocked to platform underneath machine. It is the practice to carefully pack all accessories in small boxes placed under machine.

order for export, from which the following is to be noted:

"Each machine and all parts thereof, when the same are not shipped attached to the individual machine, shall be marked with the same item number that is shown on the order list. This applies also to any and all equipment to which an item number is assigned on the order. The numbering shall be done in the following manner:

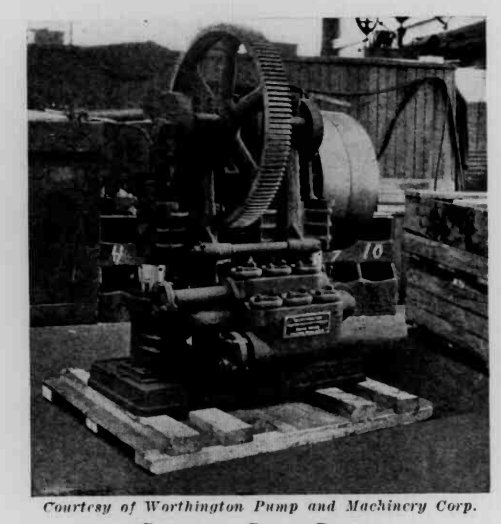
"All large and heavy parts shall be marked with letters at least 2" in height, in a color contrasting to the body color, in four different places. All small parts shall have a metal tag not less than 1½"x3" attached thereto with No. 16 gauge annealed wire. These tags shall be marked with the item number by punching or raised letters ½" in height. In no case is paint to be used for marking tags. All small parts, or anything that tags and paint cannot be used on for marking, shall have the item number stamped thereon in a place that is not injurious and is clearly visible. Shafting shall have the number stamped on each end. This stamping shall be in letters at least ½" in height."

Protection of Bright Parts.—From the circular of the Pacific Coast exporter who has just been quoted, the following paragraph is also to be noted:

"All exposed faces of machinery or machinery parts that are planed, polished or otherwise finished, shall be covered with a pure white lead and boiled linseed oil, with sufficient drier to harden properly. All interior faces of machinery or machinery parts that are planed, polished or otherwise finished, such as cylinders, shall be protected by a coating of petroleum jelly. All delicate machine parts shall be first wrapped in oil-soaked cheesecloth, then wrapped with burlap and sewed before boxing."

The specifications of the General Engineer Depot include the following: "Exposed surfaces of machined parts shall be protected with a rust-preventing coating, free from acid, which expands easily, sets quickly to a sufficient firmness, and dissolves readily when wiped down with oil, turpentine or petroleum. Adequate wood

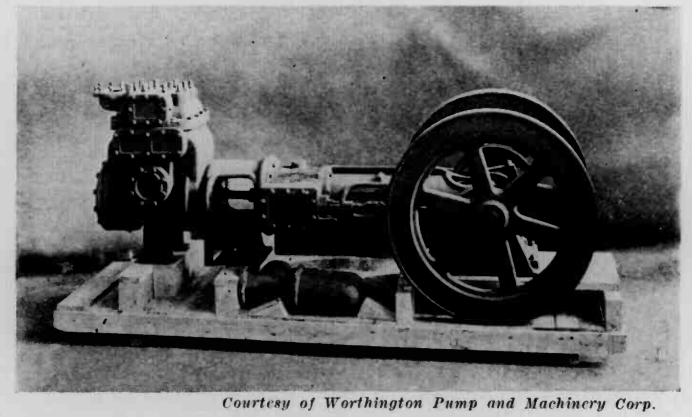
INTENTIONAL SECOND EXPOSURE



Courtesy of Worthington Pump and Machinery Corp.

PACKING A POWER PUMP.

Vertical triplex power pump set on 3" x 6" spruce timbers for skidding. The cross brace is of the same material and size.



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covers or lagging will also be used when found necessary.

"When bearings are used as supports, block supports are prepared; (1) support points will be slushed, (2) a zinc plate will be laid thereon, (3) carriage cloth or oil-cloth will be laid on the zinc, finished side to the zinc, and the other side slushed to receive the shaft."

A representative of the High Commission of a great foreign government which has offices in New York City, submits among his recommendations for the packing of machinery this advice as to the protection of bright parts: "Care should be taken to well protect the contents of the crates against moisture by properly covering all bright metal parts with a rust preventative, of which there are several kinds on the market. In the case of pieces of heavy machinery which are shipped uncrated, one of the best rust preventatives is a mixture of white lead and tallow. This mixture has the disadvantage of being difficult to remove. Among the rust preventatives used by the different automobile companies may be mentioned such compounds as coral compound, cedarolium compound, glenmore compound, etc. Some of these compounds are easier to remove than others, and in many cases it is necessary to wash the parts in steaming hot soda tanks in order to remove these protective compounds."

The English authority already quoted says that in coating bright parts it is of the utmost importance to remember that the machines may not only be exposed to rain and an occasional dose of salt water during their journey, but that in passing through custom houses cases may be opened and the coating, if not sufficiently firm, may be rubbed off in places, while even after arrival the cases may stand for some time before they can be unpacked.

Packing of Small Parts.—Instructions issued to American manufacturers by the High Commission of one of the great foreign governments include the following:

"In connection with the boxing of parts it is quite important that all small parts be contained in well water-

Courtesy of Worthington Pump and Machinery Corp.

COMPLETED FRAMEWORK OF CASE.

Illustrates further steps in packing the same machine as shown in previous illustration. Framework is ready for boards, the uprights being securely spiked to platform and braced where necessary against various parts of machine. With additional bracing afforded by case itself this provides very rigid construction.

Courtesy of Worthington Pump and Machinery Corp.

CASE CONTAINING STEAM PUMP.

Top and one side of case are removed to show method of packing. Note especially manner in which pump is supported in case by blocks placed under solid flanged portions, keeping feet from touching platform. Note also that entire weight of pump is not carried by bottom of case as sides help support weight by cross braces nailed to side boards. Top cross pieces also hold pump in firm position. Note compactness of case in relation to bulk of material.

INTENTIONAL SECOND EXPOSURE

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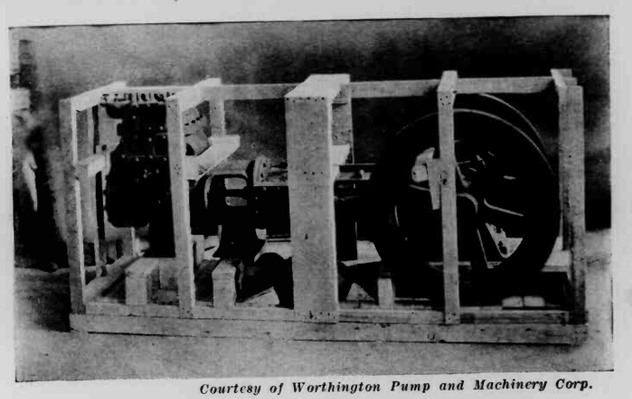

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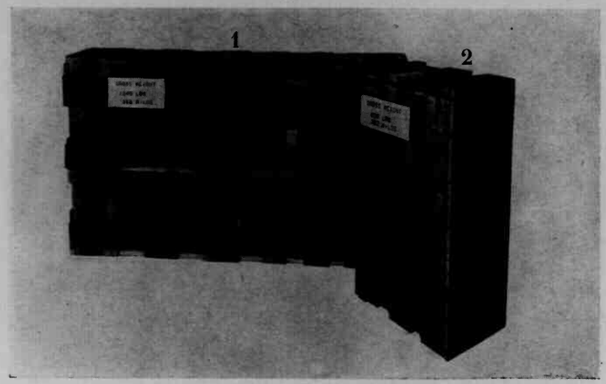
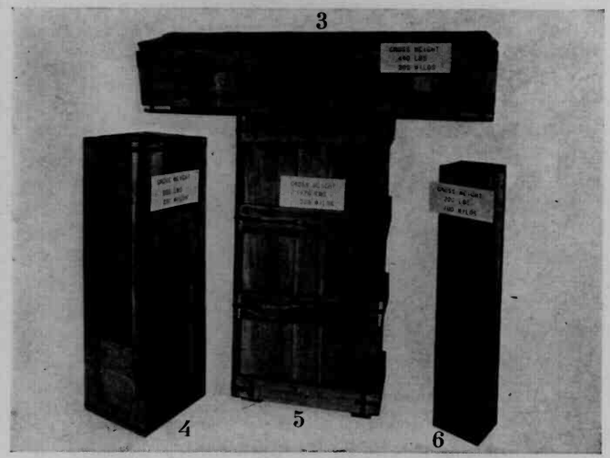


Courtesy of The Challenge Machinery Company.

CRATING PARTS OF PRINTING PRESS.

Crate No. 1 contains the side frames. Crate No. 2 the center girts. Method of construction fully described in text.



Courtesy of The Challenge Machinery Company.

PACKING PRINTING PRESS PARTS.

Crate No. 3 contains the troughs. Box No. 4 contains the cylinder; No. 5 contains all small parts; No. 6 contains the fountain. Method of packing fully described in text.

proofed bags; that all threaded parts be well protected against injury by contact with other parts. All finished or ground parts should be separately packed to avoid damage to finished surfaces. The tags designating the names and numbers of the different parts should be of such material that they will not be damaged by oil or water, and in this connection it may be mentioned that the use of aluminum or other metal tags is being generally adopted. A packing list containing the contents of all crates, boxes or packages should always be well secured in a prominent place in the interior of the box; also, it is desirable that a copy of such a list, when practicable, be well secured to the outside of the crate or box, covered with galvanized sheet iron or other suitable protection."

The utmost care is required in making certain that all parts are shipped and are so shipped that they will arrive safely and complete, as will be realized from a consideration of the great loss which may be occasioned should the parts be lost or damaged en route. A machine arriving minus essential parts is utterly useless until new parts can be secured, which may entail months of delay, which in turn may mean excessive pecuniary loss, as, for example, when a mill or factory is being equipped.

Inside Bracing and Packing.—The General Engineer Depot of the War Department among its specifications publishes the following:

"Machinery itself should be covered with water-proofing paper or oilcloth to prevent damage from moisture. Machinery should be thoroughly slushed with suitable protective compound. All loose or detached parts should be firmly and securely fixed to prevent dislodgement during transit. All finished surfaces to be amply protected against injury from salt air and water.

"Packages containing machinery, or parts, should be securely blocked in the case or crate to prevent movement.

"Electrical and mechanical apparatus to be solidly packed in excelsior, straw, salt hay, or other filler in a solid box with paneled ends, securely nailed and then

reënforced with ⅞ by 3-inch battens around the sides at the ends, with 1-inch by No. 18 gauge strap iron all the way around the battens, ends lapping at least 6 inches.

"Projecting portions of heavy castings having narrow necks must be taken off, as they will break off by jarring.

"Gray iron extended parts must be kept one-half to one inch away from covering, as the spring of boards will cause breakage.

"Where light gray iron castings or breakable machine parts are near the outside of a package, brace the case so that there may be always one inch clearance between the articles and the case.

"Two heavy cast pieces must not rest together, but must be cushioned or separated by wood brace or block.

"Cross timbers which hold heavy articles in place should be socketed at the ends where there is danger of splitting if nails only are used.

"Heavy items must be firmly bolted to skids or flooring; nothing shall be hung from sides of boxes. Unoccupied space in packing boxes must be thoroughly braced.

"Articles subject to damage by moisture shall be adequately protected.

"Switchboards shall be packed in two boxes, the inner box being floated in the outer box, 3" clear space between, this space packed with excelsior. The inner box has supports; upon these is laid the switchboard with cigarettes between; these cigarettes are two or three inches in diameter, of excelsior rolled in paper, pieces are then forced down over the cigarettes and nailed to the sides. The inner box is completed, floated in the outer box, and this properly secured."

The instructions of the foreign government's High Commission, which have already been quoted, state in this connection: "It may be mentioned in connection with packing that the use of the excelsior which was formerly used to quite an extent has now been practically eliminated, as it is not necessary to make use of such material when the contents of the boxes are well secured in place; also, it may be noted that excelsior may be considered as being subject to spontaneous combustion."

An English authority may be quoted as follows: "The sweating which takes place on board ship and affects the cases themselves also attacks their contents, especially the parts of machinery to which it is not possible to apply slush or the usual rust preventatives. In no case should machinery be packed with sawdust or wood chips when these materials can get among the parts of the gearings, as this occasions the receiver an endless amount of trouble and unnecessary annoyance."

Shipping Weights.—The War Department in its overseas shipments advised that "packages over 1,000 pounds or less than 200 pounds are to be avoided when practicable." Of course, it is not always practicable to reduce weights to this limit, and where port and interior transportation facilities at destination are such as to permit the easy handling of heavy packages there is no objection to bulk. It must also be remembered that a heavy case weighing perhaps several tons cannot be thrown around and handled so roughly during transit as can smaller cases; and that the officers of ships always pay particular and personal attention to the handling of such extremely heavy cases, because of the damage which would be done to their own vessel and to lighters or quays should freight of this description be suddenly dropped on decks or down hatchways into the holds of vessels.

An English authority calls attention to the packing in small cases sometimes required:

"In packing shipments for crude, rough transportation to interior and almost inaccessible points in such countries as Colombia, to mines in other countries similarly situated in regard to transportation facilities, it is necessary to remember that machines should be disunited and heavy parts reduced to the lightest weight possible, because bulky and heavier pieces are always left by muleteers for long periods while the lighter packages are first transported. Of course, there are some structural parts, such as base castings, where the size and weight are fixed quantities and which it is impossible to

transport on muleback. Such parts should be stripped of everything, including bolts, nuts and removable parts, and then bolted on skids both top and bottom so that they can be hauled by mules or oxen as the custom is in these countries for interior deliveries. Machines destined for such interior points are frequently exposed to the weather for many days, heavy rains succeeded by intense heat, and sometimes such machinery may be covered, after two or three weeks' exposure, with several inches of mud."

Construction of Cases and Crates.—One fact which must always be taken into consideration in packing machinery for export is the fact that cases or crates are as likely as not to be turned on their sides or even stowed upside down. This general subject has already been thoroughly treated in other pages of this volume. It is, however, believed desirable to reprint at this point further observations and instructions bearing on the construction of cases and crates, even at the risk of repetition.

The following advice is transmitted by the New York representative of the High Commission of a foreign government from whose communications on the subject of export packing quotations have already been made:

"For shipping heavy material which is subject to damage in transit and deterioration if exposed to the weather, the following principles should be adhered to in crating such material:

"Depending upon the size of the crates containing automobiles, trucks or other large heavy machines, these crates should be constructed of good material only and have such a general strength that they can resist the bending and twisting forces which may be applied to them when they are handled in loading and unloading, carried in slings, etc. This means that the floors of these crates shall be amply thick, of double thickness planking in many cases, and that the bottom, sides, ends and top of the crate be well strengthened by interior bracing and that the construction of the corners be such that the

Courtesy of Babcock Printing Press Mfg. Co.

PACKING A PRINTING PRESS.

A number 6 Standard track being placed in the skeleton of its crate. The crate is made of material 1¼" thick. Note how the track is bedded in excelsior.

Courtesy of Babcock Printing Press Mfg. Co.

COMPLETED CRATE FOR TRACK.

The track shown in the previous illustration completely crated and in the process of being moved from box shop to car.

INTENTIONAL SECOND EXPOSURE

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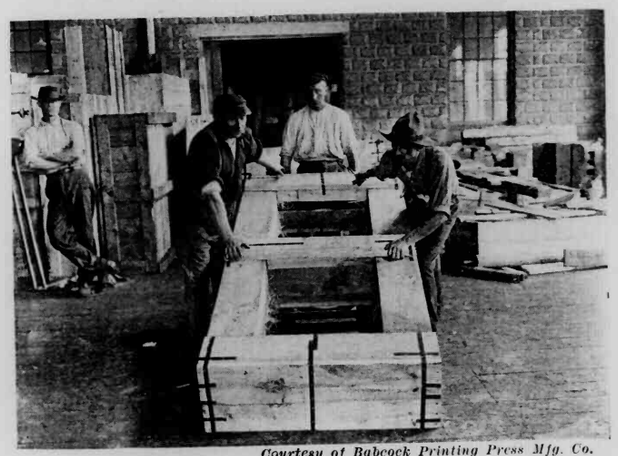

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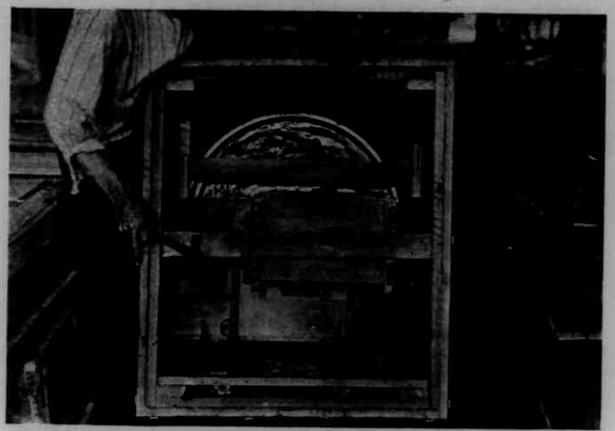

Courtesy of Babcock Printing Press Mfg. Co.

PACKING UNITS OF PRINTING PRESS.

The "outrigger" box on a number 6 Standard Press. The balance wheel can be seen beneath the feeder's platform. Note the method of placing parts in boxes. Box is made of boards 1⅛" thick. Measurements over all 3' x 4' x 4'.

Courtesy of Babcock Printing Press Mfg. Co.

A CRATED PRINTING PRESS SIDE FRAME.

The material from which this crate is made is 1¼" thick. Note that three thicknesses of this material are placed crosswise of each other on each side of frame. A crate containing a pair of feed table brackets stands at left.

bottom, sides, ends and top are well tied together. In this connection it is preferable that lag screws or bolts be used as fastenings in the corners rather than nails; also, that the bracing of the sides and the ends consist of both diagonal and vertical braces.

"Not less than three skids of large cross section and of a length equal to the total length of the crate should be fitted to the bottom of the crate. The transverse strength of the crate must be such that the crate can resist the effect of crushing when it is raised with slings. Suitable chocks, blocks, etc., must be securely fastened to the bottom or floor of the crate, to which chocks, blocks, etc., can be attached the truck or other machinery contained in the crate in such a way as to insure that there will be no movement of this machinery. In addition to the above mentioned attachments to the bottom of the crate, it is often desirable that the contents of the crate be braced firmly in place with such additional shores or chocks as may be necessary to prevent all tendency to movement.

"It is important that the crate have sufficient local strength to avoid damage to its contents if small heavy articles are placed on top. For example, in some shipments, owing to carelessness on the part of the stevedores, heavy coils of barbed wire were often placed on the tops of crates containing machines, with a consequent damage to the contents of these crates.

"It is desirable to have the sides and top of the crate made of matched boards rather than plain boards, although satisfactory crates are often constructed by using plain boards in conjunction with a good grade of strong waterproof paper. It is desirable to use such waterproof paper on the bottom, sides, ends and top of the crates, although when matched boards are used it is often omitted on the sides and ends."

The specifications of the General Engineer Depot of the War Department, among other things, provide that all packing should be as light in weight as possible and cubic contents kept to a minimum in order to economize

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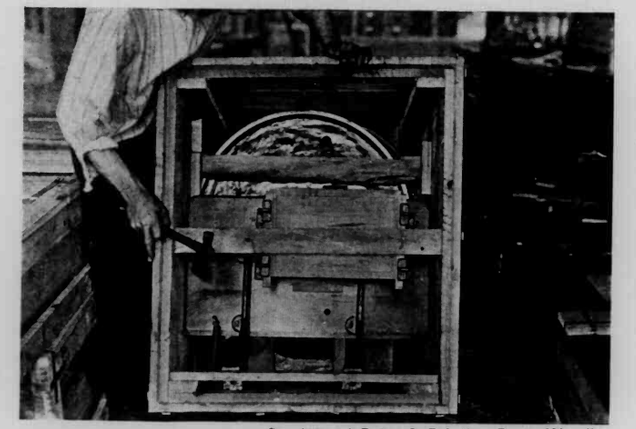

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shipping space; but the paramount consideration must always be safe handling. Brittle pine crates of half-inch board are worthless.

"Each case or crate should be firmly bound with strap or band iron. Straps should be not less than one inch wide No. 18 gauge. Ends should overlap at least 6 inches.

"All lumber used in boxing and packing to be strictly sound and of such dimensions as to insure full protection under rough handling. Under no circumstances should outside boxing be less than 13/16 inch thick.

"Packages over 300 pounds should be packed in not less than 2-inch stock, additional straps and bindings to be used at every 2½ inches for boxes exceeding 3 feet in length.

"Boxes 600 pounds weight or over shall have 4x4-inch skids, top and bottom of box, securely bolted together with ⅝-inch diameter bolts, and these bolts, wherever possible, should extend entirely through the box. To prevent shifting, ends of box must be securely braced inside.

"Use yellow pine, gum, white pine, spruce and hemlock lumber surfaced one or more sides. This gives a desirable uniformity of thickness and makes easy stenciling on more than one face of the package.

"Use cement coated or barbed wire nails—8-penny and 10-penny. This is important to make the nails hold. Not less than two in end of any board and not over four inches apart in wide boards. Six-inch boards, three nails.

"Use corner posts in all packages."

From Siberia advice is given that all cases weighing over 500 pounds be fitted with skids as there is no modern freight handling machinery in eastern Siberia, and all shipments for interior cities should receive extra strong packing as, in addition to the crude methods of handling cargo at Vladivostok, they are subject to very much rougher handling in unloading from the railway cars into river barges and again at landing; it is very likely that they will again receive rough handling in long hauls in primitive carts before reaching their destination.

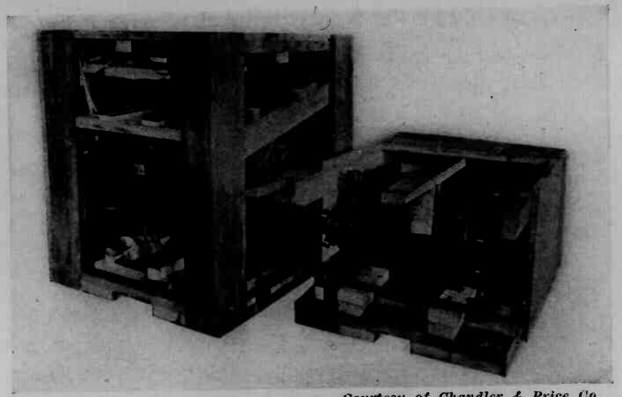
Packing of Machine Tools.—American machine tool manufacturers have for many years devoted the closest attention to disassembling, and export packages of this class of machinery give very interesting solutions of this particular problem. In addition, the machine tool presents very nice questions of proper balancing and bracing as well as the packing of the stripped portions. We find machinery of this character provided with the most delicate adjustments. Proper protection of the different surfaces is also most highly essential and this presents another angle of the packing problem.

Through the kindness of a prominent manufacturer, several photographs are reproduced in connection with this chapter which show practice that is the result of many years' experience constantly checked with results from the consignees' standpoint. A study of the bracing of the cases and of the machine, as shown in these photographs, will be of great value to all interested in export packing. By comparing the cubic contents of the assembled machine with the completed export boxes (see cuts appearing on pages 328 and 335) some idea will be gathered of the extent to which the machine in question, in process of being shipped to Holland, has been stripped and the care with which it has been packed. All finished surfaces throughout the machine are covered with a special slushing compound, developed by this particular manufacturer for his own use, and which has been found to successfully resist ravages of moisture and salt air.

Hoisting Machinery.—Among many interesting letters which have been received detailing practices of experienced manufacturers in the export packing of their products, the following from a well known manufacturer of hoisting machinery is notable: "No general rule can ever be laid down for export packing, because the size of the lumber always depends upon the weight, shape and size of the piece boxed. The first thing to ensure is a strong envelope and then to secure the part which goes into the envelope with cross bracing in such a manner that it is absolutely tight, so that jerks, jars

and slamming around cannot loosen it and cause it to slip and slide around until it breaks the box. The object is, of course, to provide packing that will stand rough usage in transit; this is a first consideration, but it must be obtained at minimum cost and with minimum weight. We have found in our experience that crates will not stand up under handling and do not furnish adequate opportunities for inside bracing, nor do they furnish protection against weather, and are often actually torn off by the use of hooks or broken by handling in slings. Flat straps securely fastened by nails and passed entirely around the case should be used. Corner straps and wire straps are entirely inadequate. For marking we use a stencil cutting machine but where foreign alphabets are used, such as the Russian, Chinese, etc., we have a draftsman make a drawing of the mark, from which a brass stencil is made."

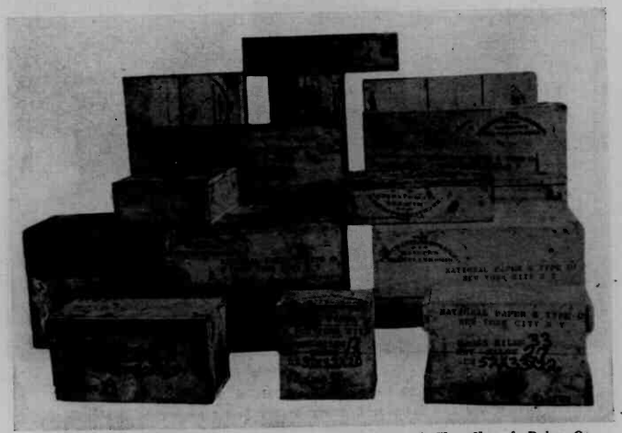
Another large shipper of hoisting machinery writes of his experience and practice in shipping as follows: "On boxes or crates ranging from three to five feet square and approximately six to eight feet in length, carrying a weight of from two to four tons, the box or crate should be made with bottom skids of 3"x4" or 4"x4" pine lumber beveled at the ends to permit application of slings and rollers. The floor of our boxes is made of 2-inch plank, vertical posts of from 2"x4" to 3"x4" timbers bolted directly to the bottom skids. Sides, tops and ends of our cases we make from 1¼-inch S2S pine. Boxes carrying a greater weight than four tons must be made from very heavy lumber for skids, vertical posts, sides, tops and ends, some of our cases having 8"x8" skids and 6"x6" posts with 2-inch plank for the sides, tops and-ends. Large pieces of machinery are bolted to the floor, sides or ends, or securely held by blocking and strap iron to prevent shifting. Small parts are invariably packed in straw or excelsior and always wrapped in oilcloth or waterproof paper when of a character likely to be damaged by moisture. Further waterproofing is provided by the use of tarred paper inside



Courtesy of Chandler & Price Co.

METHOD OF INTERIOR BRACING.

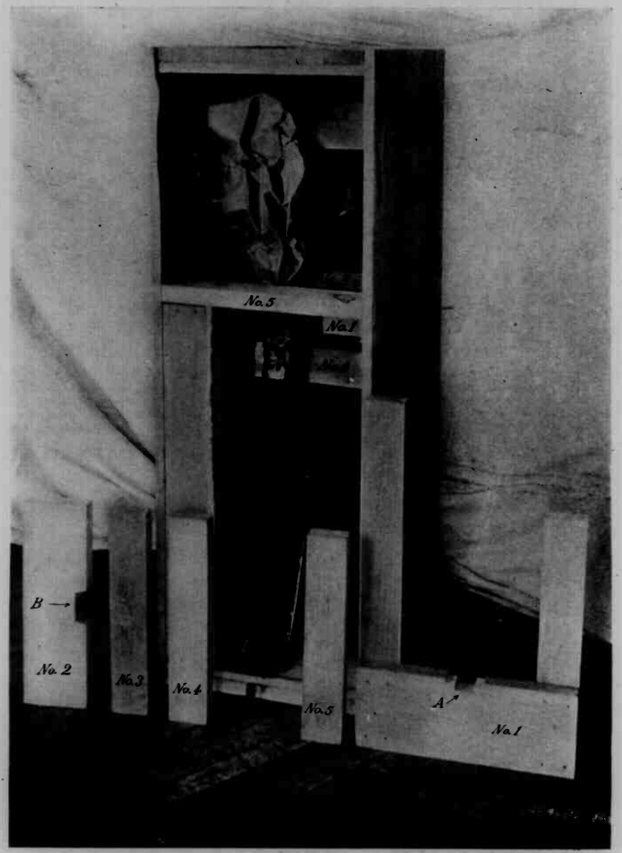
Case contains printing press packed for export. Platform has as its base heavy 2" boards on which at either end is placed a 2" x 6" cleat. Space between cleats is filled by 1" boards, making a strong and substantial platform. Sides of case are made of unplaced 1" selected Norway pine. Machine is bolted to platform and case braced in all directions by 2" x 4" stuff.



Courtesy of Chandler & Price Co.

PRINTING PRESS PACKED FOR MULEBACK

This is the same press shown in previous illustration.



Courtesy of Boston Wire Stitcher Co.

PACKING OF WIRE STITCHING MACHINE.

Pieces shown are the interior bracing before being placed in case where they are identified by corresponding numbers. For detailed description see text.

the cases. All parts are given from one to two coats of paint and bright parts are slushed with a compound made of white lead and tallow."

Steam Pumps.—Several photographs illustrating the export packing of a large manufacturer of steam pumps and similar machinery are reproduced on pages 336 and 339. Writing in regard to its packing the company in question states that the following features of its practice are to be noted in addition to the details explained in the captions: In the cut on page 336, it is to be noted that the discharge air chamber has been removed and is bolted and blocked to the platform underneath the machine. All accessories, such as speed governor, lubricators, oil cups, wrenches, etc., are packed in small boxes which are also placed underneath the machine in order to utilize space to best advantage. Another cut (page 339) directs special attention to the manner in which the steam pump is supported inside the case by blocks placed under the solid flanged portions of the pump, keeping the feet from touching the bottom. The entire weight is not carried by the bottom of the case as the sides help support the weight by the cross braces nailed to them. The top cross braces are so designed as to hold the pump firmly against lateral movements. This case is believed to be as compact as possible under the circumstances, the important feature in saving freight rates. Another photograph supplied by this manufacturer, reproduced at top of page 336, illustrates a vertical triplex power pump mounted on 3″x6″ spruce skids. The cross brace shown is of the same material and size.

Extra Heavy Machinery.—No general rules can be laid down as to the packing or lack of packing or even the special protection that is required in exporting large and heavy machinery, especially when of irregular shapes. A manufacturer of machinery of this description writes that it is practically impossible to construct a package that will stand the strain of the weight in handling with ropes and slings and it is, therefore, very much better frequently to use as little crating as possible

on such pieces, as in some instances crating would be certain to give way and permit shocks which might cause the lines to slip or part. Photographs supplied by this manufacturer, which are reproduced on pages 371, 602, are submitted as illustrating the reasonableness of the claim made. It is stated that the practice is to place boards over finished bored holes and bearings, and to wrap with burlap and protect by narrow strips of wood fastened together with steel bands, the smooth finished surfaces, as on shafts, etc. All such machinery is dismantled or knocked down so far as possible to make the individual pieces of the lightest weight. Each individual piece is stenciled with paint in good sized letters and figures showing consigning marks, over all dimensions and gross weights.

The packing of large pieces, boilers, etc., may be illustrated by the packing shown on page 371, of a condenser prepared for export shipment by a prominent American manufacturer. In this case the saddles and feet are not cast integral with the shell. The cut is felt to adequately explain the packing believed necessary and desirable.

Printing Presses.—It is doubtful if any one class of American machinery has been more widely distributed all over the world than have our printing presses. The United States is without doubt the country of greatest progress in the graphic arts, and the spur has been constantly applied to the production of machinery that has expressed high attainment in economy, efficiency and simplicity. A number of American manufacturers of printing machinery have a worldwide distribution of their products, and have supplied some interesting photographs of their export packing methods and practices which are reproduced in connection with this chapter.

The printing press varies from a fairly light machine to one weighing a number of tons, and while it is not a piece of precision machinery, it is none the less one of fine adjustments to which careful attention must be given in packing. One well known manufacturer supplies us with photographs (see pages 345 and 346), and writes: "We have found after thorough investigation that the chief cause for broken parts has been due to their being packed too tightly in the vessel; that when large parts, like frames, tracks, etc., were broken it was not safe merely to make the cases of heavier lumber.

"Relative to the material used, we may say that we have always felt that spruce was best. It is very tough, does not split readily and is strong—a combination which is not found in many of the ordinary hard woods used for boxing. For export boxes we use from 1¼-inch up to 1½-inch lumber and in the vital places we use two boards, spiking them firmly together. A plank made of two thicknesses thus spiked together is often far stronger than a single plank, although this is only one reason for using this method, the other being our own convenience in not having to carry so many different sizes of lumber in stock."

Other cuts illustrating the packing of printing machinery by another manufacturer are shown herewith (page 351), and are adequately explained by the captions to these cuts.

Still other illustrations of the packing of printing presses have been supplied by a third manufacturer in the two cuts appearing on page 340 which show six different packages. The placards attached showing weights in pounds and kilos were merely supplied for the purpose of photographing, in order to give the reader an idea of the weight of each package in connection with the quality of the packing furnished. In reference to these packages, further details are necessary than it is possible to supply in suitable captions to the cuts. The manufacturer supplies the following data:

"Crate No. 1 contains side frames and is made by taking two pieces 2″x4″x7′ long. Fasten these together with five cleats 1″x6″x13½″ in such a manner that the corners are flush. The top consists of two pieces; one, 1″x6″x7′ and one, 1″x7½″x7′. Fasten together with three cleats 1″x6″x13½″; then fill in with 1″x6″x13½″

cleats until top is solid. The ends are composed of three pieces, each 1″x8″x15″ nailed across the two upright sides. The sides are composed of seven pieces, each 1″ x8″x4′3″, making fourteen pieces in all. All of the side pieces on each side are long enough so that the end is nailed to the cleats on top and bottom. Three pieces 1″x8″x7′2″ are then nailed on each side lengthwise, full length of the crate—one in the center; one 4½″ from the top and the other 2″ from the bottom.

"The inside braces are made as follows: Two pieces ⅞″x8⅞″x16″, with a small cleat between at each end, thus forming a space between, are nailed together and placed inside between the front and back part of the frames with a ½″ bolt running completely through the two frames, sideboards, and brace to hold this brace in position. There is one of these braces at each end. One piece 2″x8¾″x7′ is nailed to the bottom on the inside to keep bottom of frames apart. One piece ⅞″x8″x4′, hardwood, is nailed upright between center of the two side frames to keep frames from spreading. Two cleats 1″x6″x16¼″ are nailed to this upright and the ends nailed to the upright side pieces. Two pieces 1″x7″x8″, with small cleats between, are nailed together and placed between the cylinder boxes in side frames, and a ½″x18″ bolt running completely through the sides, cylinder boxes and braces.

"Nine iron bands, each 28″ long are nailed, three each, over top, bottom and ends, overlapping 4″ on each side. Formerly these merely extended over the corners and not completely across the ends, bottom and top.

"Crate No. 2 contains center girts. Each end consists of two pieces, each 2″x5″x24½″ and 2″x4″x24½″, the former being on the gear side and the latter on the opposite side. Inside of these, to hold them together, are nailed two cleats each 1″x6″x16″, in such a manner as to allow the end of the main gear shaft to extend up between the 2″ end pieces. Two ¾″ bolt holes are made through the 2″x5″ and 2″x4″ end pieces at each end of the crate. Through these holes, ¾″x2½″ cap screws

Courtesy of Sleeper and Hartley, Inc.

(1 & 2) BASE OF CASE FOR NAIL MACHINE.

The base consists of 3 heavy longitudinal skids A, A¹, A², covered by a platform of heavy boards, B. An additional feature of the base (illustration 2, end view of base) is a temporarily attached framework C, shown in illustration 3 as the framework for the cover.

Courtesy of Sleeper and Hartley, Inc.

(3) FRAMEWORK OF CASE.

Machine is lowered into position on base and bolted thereto. Central support D, which is long enough to stretch across two base skids, is put in place and wooden wedges are driven between D and bottom of machine to prevent shrinking of support. Upright corner boards E, E¹, E², E³, upper framework C, side supports F, end supports G, and supporting timbers H, H¹, H², etc., are nailed into position.

INTENTIONAL SECOND EXPOSURE

cleats until top is solid. The ends are composed of three pieces, each 1″x8″x15″ nailed across the two upright sides. The sides are composed of seven pieces, each 1″ x8″x4′3″, making fourteen pieces in all. All of the side pieces on each side are long enough so that the end is nailed to the cleats on top and bottom. Three pieces 1″x8″x7′2″ are then nailed on each side lengthwise, full length of the crate—one in the center; one 4½″ from the top and the other 2″ from the bottom.

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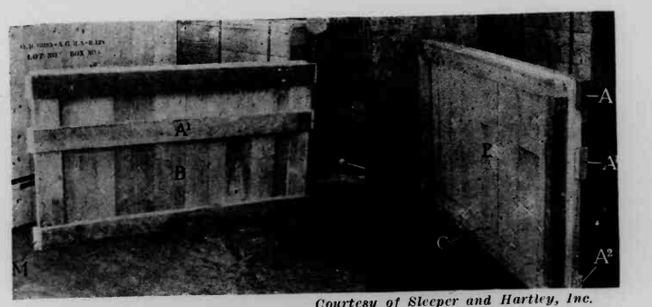

Courtesy of Sleeper and Hartley, Inc.

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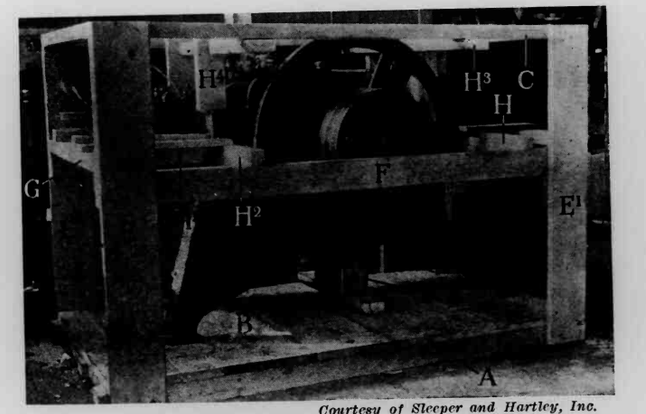
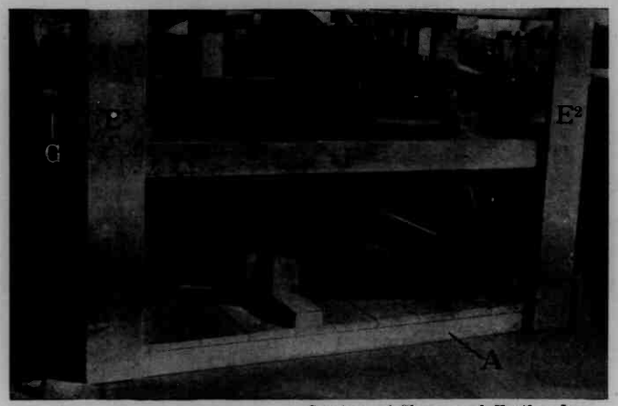


Courtesy of Sleeper and Hartley, Inc.

(3) FRAMEWORK OF CASE.

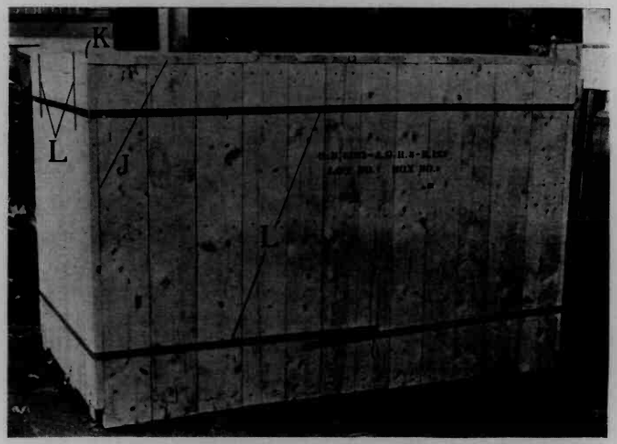
Machine is lowered into position on base and bolted thereto. Central support D, which is long enough to stretch across two base skids, is put in place and wooden wedges are driven between D and bottom of machine to prevent shrinking of support. Upright corner boards E, E¹, E², E³, upper framework C, side supports F, end supports G, and supporting timbers H, H¹, H², etc., are nailed into position.



Courtesy of Sleeper and Hartley, Inc.

(4) ANOTHER VIEW OF FRAMEWORK OF CASE.

This illustration shows side of case opposite to that reproduced in 3.



Courtesy of Sleeper and Hartley, Inc.

(5) THE COMPLETED CASE.

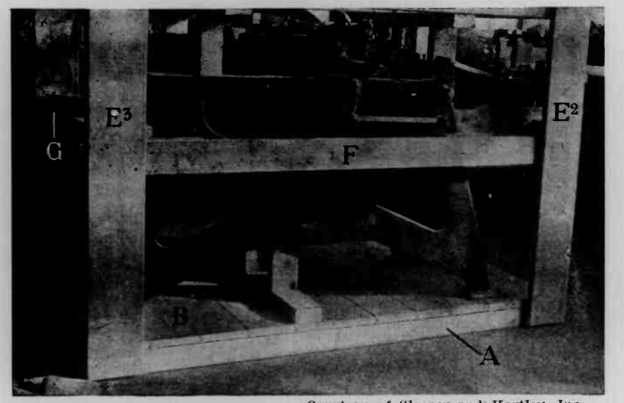
Note that upper corners of case K are bevelled off to prevent splintering of corner cover boards by angular blows. Heavy band iron is carried around case and over top in two places, L. The skids are bevelled off and end covering boards are not allowed to go down over ends of skids; side boards do not touch floor within half an inch.

which are used with the machine are placed in order to hold the contents solid. These bolts go into the tapped holes in the center girt. Each side is composed of three pieces, each 1″x6″x4′2″. Two of these are nailed to the ends so that they are flush with the end pieces at the corners, the other one being equal distance between. The top consists of seven pieces 1″x6″x19″, nailed to sides. The bottom is composed of three pieces 1″x6″ x4′2″, nailed to ends lengthwise, for skids. For the inside braces two pieces 2″x3″x16″ are nailed to each side piece to hold the gears in place. The crate is then encircled at each end with an iron band 6′ long. Twelve bands 11″ long are used at side and end pieces.

"Crate No. 3 contains the troughs. Bottom is made of two skids 2x4 inches, 6 feet 6 inches in length, cleated together with five cleats each 1x6x12 inches, end cleats being one inch from the end of skids. The sides are composed of four pieces, each 1x6 inches and 6 feet 6 inches in length, cleated together with five cleats on each side 1x6x19½ inches, the sides being nailed to the bottom with the cleats inward. The top is made from eight pieces 1x8x17½ inches nailed across to the sides of the crate. Two pieces 1x6 inches, 6 feet 6 inches long, are then nailed lengthwise on top to form skids. The ends are made of 1x8 inches stuff, 14½ inches long or cut to fit from side to side. Three iron bands are then nailed completely around the center and ends of the crate.

"Box No. 4 contains the cylinder of press whose packing is now being described. The bottom of this box consists of two pieces 2x4 inches, 4 feet 10 inches in length, nailed together with boards running crosswise 17 inches long, making the size of the bottom 17 inches by 4 feet 10 inches. The top is made of exactly the same size material. The sides are made of boards 16 inches in length nailed to top and bottom, all boards being flush at the ends. The ends consist of 16-inch boards crosswise from top to bottom. Four cleats 1x4 inches and 4 feet 10 inches long, are nailed on the sides at the corners the full length of the box. Between these cleats there

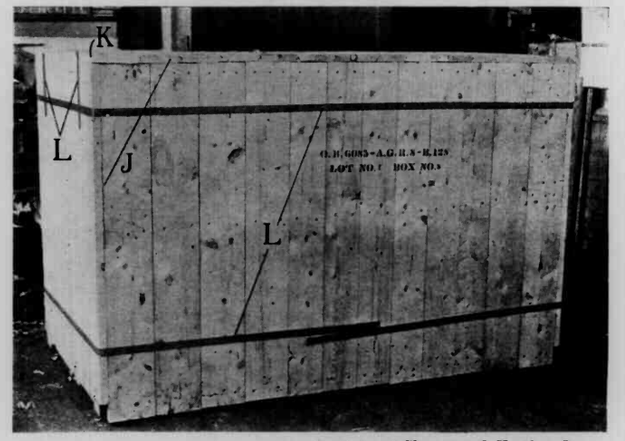
INTENTIONAL SECOND EXPOSURE



Courtesy of Sleeper and Hartley, Inc.

(4) ANOTHER VIEW OF FRAMEWORK OF CASE.

This illustration shows side of case opposite to that reproduced in 3.



Courtesy of Sleeper and Hartley, Inc.

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which are used with the machine are placed in order to hold the contents solid. These bolts go into the tapped holes in the center girt. Each side is composed of three pieces, each 1″x6″x4′2″. Two of these are nailed to the ends so that they are flush with the end pieces at the corners, the other one being equal distance between. The top consists of seven pieces 1″x6″x19″, nailed to sides. The bottom is composed of three pieces 1″x6″ x4′2″, nailed to ends lengthwise, for skids. For the inside braces two pieces 2″x3″x16″ are nailed to each side piece to hold the gears in place. The crate is then encircled at each end with an iron band 6′ long. Twelve bands 11″ long are used at side and end pieces.

"Crate No. 3 contains the troughs. Bottom is made of two skids 2x4 inches, 6 feet 6 inches in length, cleated together with five cleats each 1x6x12 inches, end cleats being one inch from the end of skids. The sides are composed of four pieces, each 1x6 inches and 6 feet 6 inches in length, cleated together with five cleats on each side 1x6x19½ inches, the sides being nailed to the bottom with the cleats inward. The top is made from eight pieces 1x8x17½ inches nailed across to the sides of the crate. Two pieces 1x6 inches, 6 feet 6 inches long, are then nailed lengthwise on top to form skids. The ends are made of 1x8 inches stuff, 14½ inches long or cut to fit from side to side. Three iron bands are then nailed completely around the center and ends of the crate.

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are nailed three cleats on each side 1x4x11 inches, the ends of the latter meeting the longer cleats. One of these cleats on each side is in the center of the box, the other four being at the corners. Iron bands are placed completely around the ends and center of the box over the 11-inch cleats.

"Box No. 5 contains small parts of this printing press. The ends of the box are made 16 inches deep of 1x28-inch boards, cleated together with 1x4-inch cleats 20 inches long, the latter extending 1 inch on each end but flush with the ends of the boards. The sides are 5 feet 10 inches long, 16 inches wide, of 1-inch boards nailed to the ends flush with the cleats of the latter. The top and bottom are made of 1-inch boards, 5 feet 10 inches long by 30 inches wide, nailed to the ends. Four cleats 30 inches long are then nailed across the bottom, and the same on the top, two of them being at the corners, the other two at equal distances between. The eight side cleats are long enough to overlap the top and bottom cleats. The connecting top, bottom and side cleats are reënforced at the corners with bands 12 inches long. Four bands are nailed over each end at the corners binding the end cleats to the top and bottom cleats. Two cleats 1″x6″x5′10″ are nailed to one side of the box and these serve as skids. Four iron bands approximately 8″ long are nailed to each end of skids, lapping 4″ over the end of box.

"Box No. 6 contains fountain, and is made with two one piece ends, each 8½x8x2 inches. The sides are also preferably in one piece 55x8x1 inch. The top and bottom are made of stuff 55x10½x1 inch.

"Three iron bands 40″ long are nailed completely around the box, one at each end and the other around the center.

"The lumber used is so-called hard wood, usually gum. By referring to boxes Nos. 1, 3, 4, and 5 it will be noticed that on one side at least the cleats run full length of box, serving as skids so that the box can be handled on rollers when necessary. On boxes 2 and 6 these skid-

cleats are not necessary as the boards run the long way of box. Our theory is that some provision should be made so that every box can be handled on rollers when required."

Wire Stitching Machinery.—The wire stitching machine is a good example of a small machine that requires very careful export packing. While by no means fragile or delicate, as are precision machinery and instruments, it is none the less a highly specialized piece of machinery which must be carefully packed if fine adjustments are to be conserved and the machine is to arrive at destination in good condition. It has many bright and nickeled parts and must be carefully protected by proper slushing in addition to being thoroughly wrapped in waterproof paper. The wedging used inside the case must positively guarantee against motion, or damage would inevitably result. The accompanying photograph (page 352) is supplied by a concern which has made an exhaustive study of suitable export packing for its machinery. The blocking or wedges shown both outside the case and in position in the packed case, bearing duplicate numbers, display the thought which has been given to the question of suitable wedging for the machine. In explaining the method of packing this company writes: "The finished parts are coated with a slushing grease and then wrapped in waterproof paper. The blocking No 1 is first nailed together, consisting of three pieces, and is then placed in position inside the case, one end only showing in the photograph, that being the long end. The machine is then placed in position so that the back is firmly locked in Notch A of block No. 1. The next process is the bolting of the machine to the bottom with ⅜x3½-inch carriage bolts. Block No. 2, with notch as shown, is then placed over the top of the frame and pressed down firmly. Block No. 3 is used to hold the machine against No. 1, and block No. 4 holds the machine down and acts as an auxiliary to the carriage bolts. The small box shown at the left of the case contains the work-table and small parts removed from

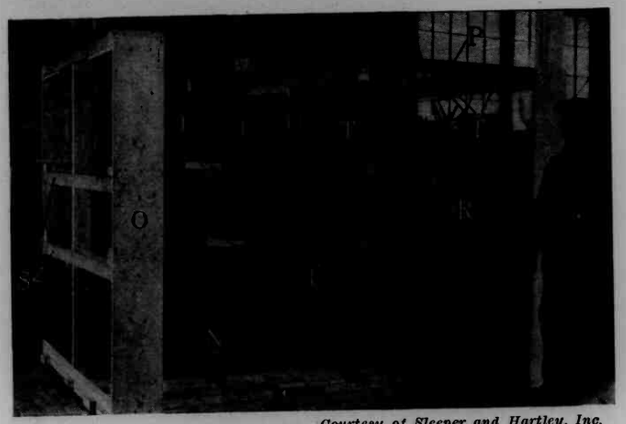
the head of the machine. It is 26½x5¾x3 inches. This is nailed in position and block No. 5 is then attached and the case is complete as shown and ready for its cover. These cases are made of 1 1/16-inch native eastern pine, tongued and grooved with tongues glued. The ends are cleated and the box nailed with 10-penny cement coated wire nails, bound with strap iron on both ends and in the center. The particular case shown is 45x15½x25 inches inside measurement."

Wire Working Machinery.—A prominent manufacturing firm, making machinery for working wire, supplies photographs (see cuts on pages 357, 358, 363 and 364), with the following notable description of the packing, and the methods employed:

"By way of preface, we might say that we have been making shipments for a number of years to Australasia, India, China, Japan, South and Central America, the British Isles, and the Continent of Europe, as well as to the countries bordering the Mediterranean.

"The methods of packing and boxing which we have adopted and which will be illustrated and described hereafter, have been such that we have had no complaints of breakage from our foreign customers, nor have our casings ever been considered insufficient or inadequate. On the contrary, we have had a number of unsolicited testimonials from foreign customers and agents, complimenting us upon the manner in which our packing has withstood the varied conditions of handling, stowing and shipping, all over the world. The head of our shipping department has had a long and varied experience in connection with export packing and shipping, and has had also a very varied experience at sea and in foreign ports, so that he is thoroughly familiar with all the conditions of handling and stowing freight on ships, lighters and dock, in all of the countries mentioned.

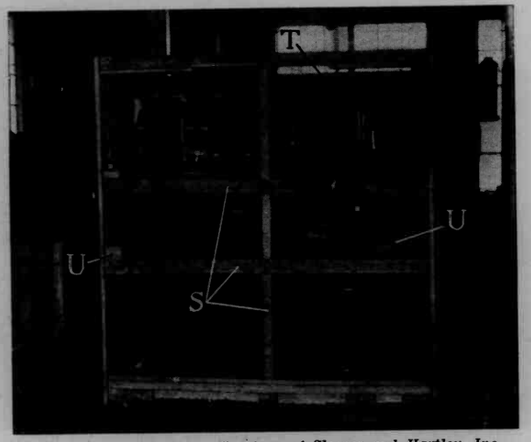
"Apart from the strength of the base and outer casings, our main reliance is placed upon a system of strutting or buttressing, whereby the machine is very securely supported within the case, so that it will travel



Courtesy of Sleeper and Hartley, Inc.

(6) PACKING OF SPRING-COILING MACHINE.

A solid and compact machine weighing 10 tons and having few open spaces. Base of case N is made of two thicknesses of board, 1¼" and 1¾"; reënforced and fastened to six longitudinal skids. After machine is bolted to base, corner supports O and top frame P are nailed into position. Struts and supports R and S are placed and firmly nailed. Similar struts T are secured to top frame P.



Courtesy of Sleeper and Hartley, Inc.

(7) FRAMEWORK OF CASE.

The same machine as shown in 6, the photograph showing one end of case. Note the solid buttresses U which effectually buttress the framing for the 4 sides and cover against the solid body of the machine.

INTENTIONAL SECOND EXPOSURE

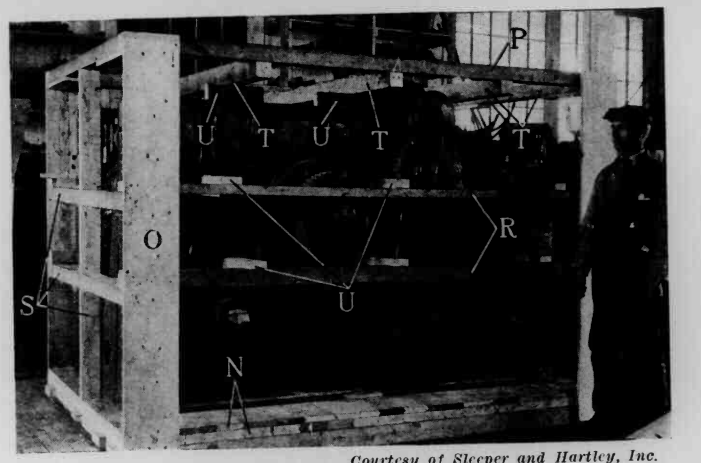
the head of the machine. It is 26½x5¾x3 inches. This is nailed in position and block No. 5 is then attached and the case is complete as shown and ready for its cover. These cases are made of 1 1/16-inch native eastern pine, tongued and grooved with tongues glued. The ends are cleated and the box nailed with 10-penny cement coated wire nails, bound with strap iron on both ends and in the center. The particular case shown is 45x15½x25 inches inside measurement."

Wire Working Machinery.—A prominent manufacturing firm, making machinery for working wire, supplies photographs (see cuts on pages 357, 358, 363 and 364), with the following notable description of the packing, and the methods employed:

"By way of preface, we might say that we have been making shipments for a number of years to Australasia, India, China, Japan, South and Central America, the British Isles, and the Continent of Europe, as well as to the countries bordering the Mediterranean.

"The methods of packing and boxing which we have adopted and which will be illustrated and described hereafter, have been such that we have had no complaints of breakage from our foreign customers, nor have our casings ever been considered insufficient or inadequate. On the contrary, we have had a number of unsolicited testimonials from foreign customers and agents, complimenting us upon the manner in which our packing has withstood the varied conditions of handling, stowing and shipping, all over the world. The head of our shipping department has had a long and varied experience in connection with export packing and shipping, and has had also a very varied experience at sea and in foreign ports, so that he is thoroughly familiar with all the conditions of handling and stowing freight on ships, lighters and dock, in all of the countries mentioned.

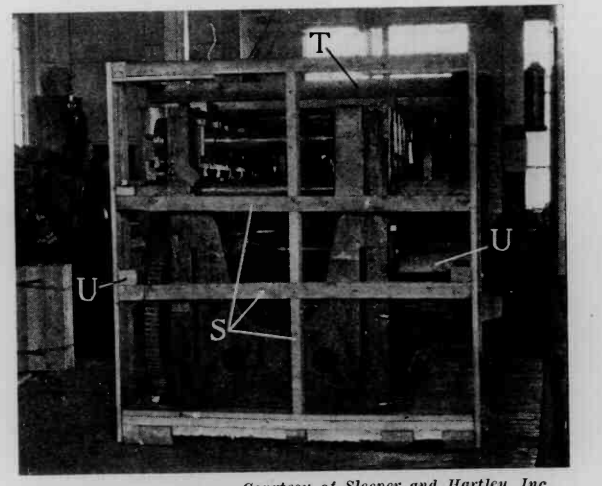
"Apart from the strength of the base and outer casings, our main reliance is placed upon a system of strutting or buttressing, whereby the machine is very securely supported within the case, so that it will travel



Courtesy of Sleeper and Hartley, Inc.

(6) PACKING OF SPRING-COILING MACHINE.

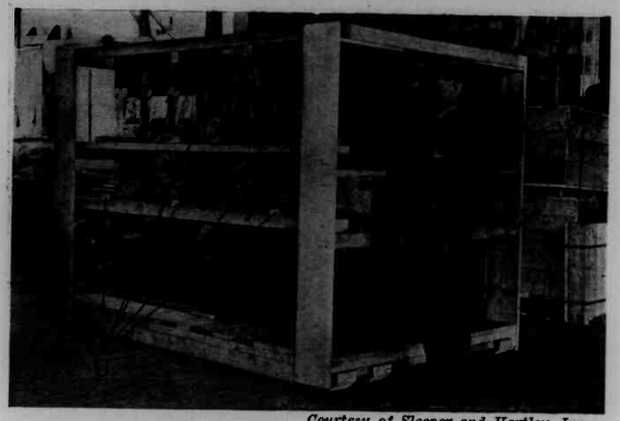
A solid and compact machine weighing 10 tons and having few open spaces. Base of case N is made of two thicknesses of board, 1¼" and 1¾", reënforced and fastened to six longitudinal skids. After machine is bolted to base, corner supports O and top frame P are nailed into position. Struts and supports R and S are placed and firmly nailed. Similar struts T are secured to top frame P.



Courtesy of Sleeper and Hartley, Inc.

(7) FRAMEWORK OF CASE.

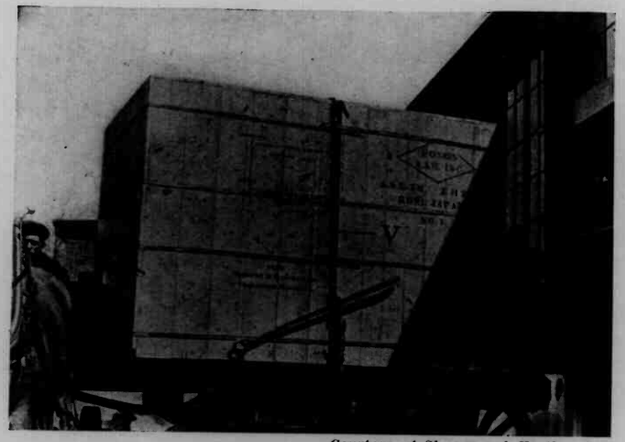
The same machine as shown in 6, the photograph showing one end of case. Note the solid buttresses U which effectually buttress the framing for the 4 sides and cover against the solid body of the machine.



Courtesy of Sleeper and Hartley, Inc.

(8) BUTTRESSING THE FRAMING.

Another view of machine shown in 6 and 7. Note the solid buttresses U.



Courtesy of Sleeper and Hartley, Inc.

(9) THE COMPLETED CASE.

Note especially the broad band with arrows V indicating center of gravity of case and so marked. This indicates the point at which sling chains are to be carried around the case in transhipping.

uninjured, whether stowed on end, on its side, or upside down.

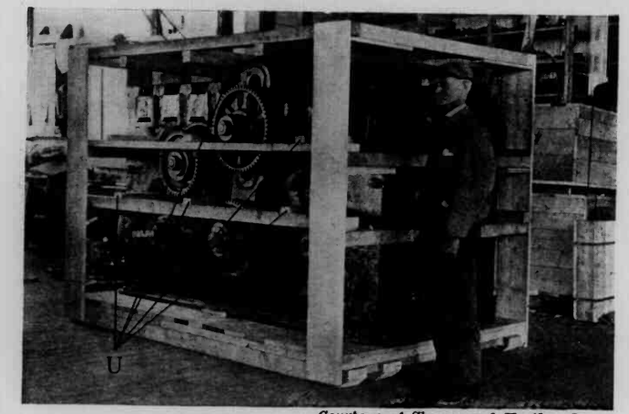
"The illustrations and descriptions will deal with two separate types of machinery. The first will be our standard nail machines. These are open-framed machines, with a good deal of space in and around them, and having the weights concentrated at two or three specific points. The machine which we are illustrating and describing is our No. 3 size of this machine, the net weight of which is approximately 2,200 pounds. In the majority of cases, it is desirable that machines of this type be shipped set up, all ready to run, after the slushing has been cleaned off.

"As shown in illustration No. 1, it is our custom to first provide a platform or base. This base is seen to consist of three longitudinal skids or heavy timbers, covered by a flooring of heavy boards. These skids are marked, respectively, A, A^1, A^2, and the flooring is distinguished as "B." Upon referring to illustration No. 2, an end view of this base platform is shown As an additional feature on this particular base, a rectangular framework will be seen, which is temporarily attached to the frame, and designated as "C." The purpose of this frame "C" will be clearly seen in illustration No. 3, where it is shown at the top of the picture in position forming the framework for the cover of the case.

"Parenthetically, we might say that it is our custom to make up these complete bases and cover pieces, "C," ahead of time, nailing them together temporarily, so that they may be stowed away readily. We carry a considerable stock of them on hand, so as to lose as little time as possible in packing and shipping, when the machines begin to arrive in our shipping department from the inspection department.

"Returning to the base, it will be noted that the purpose of the central skid A^1 is to carry the weight of the side legs of the machine, giving a solid foundation for it, and affording as well a means by which these legs are fastened to the skids. In all cases it is desirable that

INTENTIONAL SECOND EXPOSURE



Courtesy of Sleeper and Hartley, Inc.

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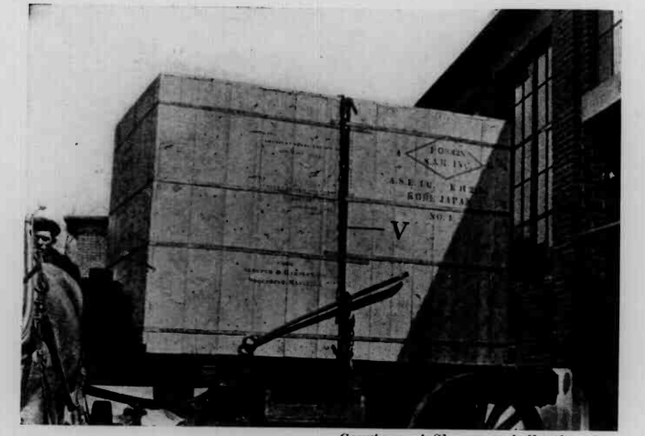

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"As shown in illustration No. 1, it is our custom to first provide a platform or base. This base is seen to consist of three longitudinal skids or heavy timbers, covered by a flooring of heavy boards. These skids are marked, respectively, A, A^1, A^2, and the flooring is distinguished as "B." Upon referring to illustration No. 2, an end view of this base platform is shown As an additional feature on this particular base, a rectangular framework will be seen, which is temporarily attached to the frame, and designated as "C." The purpose of this frame "C" will be clearly seen in illustration No. 3, where it is shown at the top of the picture in position forming the framework for the cover of the case.

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"Returning to the base, it will be noted that the purpose of the central skid A^1 is to carry the weight of the side legs of the machine, giving a solid foundation for it, and affording as well a means by which these legs are fastened to the skids. In all cases it is desirable that

skids be placed below and parallel with the legs of any machine for the purpose of supporting them.

"The machine is lowered into position on the base and bolted thereto, and a strong central support, "D," is then put in place to support the center of the machine. Wooden wedges are driven between the support "D" and the bottom of the machine, and are nailed in place. These wedges prevent the support shrinking away as the lumber dries. The base of the support "D" is made long enough to stretch across two of the base skids. The four upright corner boards, E, E^1, E^2, E^3, are then nailed in place to the foundation, and the upper framework "C" is then nailed into place between these uprights. The side supports "F" and the end supports "G" are then secured firmly into place.

"The supporting timbers indicated as H, H^1, H^2, etc., are then fitted and well nailed in position. These timbers are so placed and disposed about the machine as to effectually support and buttress it against the sides of the case, so that no movement of the machine can possibly occur, whether the case is turned on end, on its sides, or upside down. These supporting timbers will, of course, vary with the character and type of the machine, but in all cases they should be of a good quality of lumber, and very firmly secured in place, so that they cannot possibly slip in the event of the side boards giving way, or of the lumber shrinking in the course of time.

"Illustration No. 4 shows the opposite side of the machine. When all supporting timbers described above have been mounted into place, the side boards are then added, as shown in illustration No. 5, and when these have been completed and securely fastened, the cover, "J," is nailed on.

"It should be noted that in all cases the tongued and grooved or what is known in the trade as 1¼" matched spruce is used for casing. It is desirable that the upper corners of the case be beveled off, as shown at "K," so as to prevent the corner cover boards splintering by angular blows. Heavy band iron, of at least 1" in width,

is then carried entirely around the case, in two places, and is also carried around the cover, in two places, as shown in the illustration at "L." These band irons are always carried transversely of the boards, so as to hold them together. Referring to illustration No. 1, it will be seen that the ends of the skids are beveled off, as shown at "M," and upon referring to illustration No. 5 it will be seen that the end covering boards are not allowed to go down over the ends of the skids, and that the side boards are not allowed to touch the floor within half an inch. When so packed and cased, the completed box is free to be rolled or handled without injuring the ends of the boards forming the sides or ends of the case.

"The second type of machine with which our description deals is a solid, compact type of spring coiling machine having few, if any, open spaces, very heavy and calling for a slightly different method of packing.

"As shown in photograph No. 6, the base is made up of two thicknesses of boards, 1¼" and 1¾" respectively, reenforced and fastened to six longitudinal skids. This provides a very substantial platform or base upon which the machine is lowered and to which it is bolted firmly. The two thicknesses of boards are indicated at "N." In this case, it should be said that the machine is one of our No. 5 coilers, weighing approximately ten tons.

"The corner supporting boards "O" are then nailed into place with the top frame "P" in position, as in the method of casing previously described, and a series of struts and supports shown at "R" and "S" in photographs Nos. 6 and 7 are put into place and nailed firmly on all four sides. At the same time, similar struts "T" are secured to the top frame "P." Such a structure stiffens the whole case very materially, affording means to secure the side and end buttresses and supports, and giving at the same time very substantial support to the covering boards.

"Upon this foundation we now proceed to fit in the solid buttresses shown in photographs Nos. 6, 7 and 8, and indicated at "U," which effectually buttress the

framing for the four sides and cover against the solid body of the machine. When all the necessary struts and supports have been mounted in place and firmly secured, and when all of the loose machine parts which are to be shipped inside the case have been firmly secured, so that they cannot break loose in any way, the side and top covers are firmly nailed in position, as previously described, and are secured with band iron. Photograph No. 9 shows the completed machine.

"An important point is the broad band with arrows shown as "V" in photograph No. 9, which indicates the center of gravity of the case and is so marked. This is important as it indicates the point at which the sling chains are to be carried around the case in transhipping.

"It is, of course, understood that where shipments are being packed for foreign countries, a first rate quality of slush is used on all bright parts and all machined parts so as to prevent rusting. Small and delicate parts should be oiled and wrapped in oiled paper.

"So far as lumber is concerned we use spruce in practically all cases whenever it can be procured. We formerly used 1¾" in our heavier cases, but found that by reenforcing cases inside very strongly we could use lighter lumber and are now employing 1¼" matched spruce, saving additional expense and some extra freight charges. For the flooring of the bases of the heavier machines we use 1¾" spruce.

"We make skids for our smaller machines of 3"x6" timbers. using on the larger machines 4"x6" and 4"x8"."

CHAPTER XIV

PACKING OF AGRICULTURAL MACHINERY

IDENTICALLY the same advice and instructions which have been offered in other chapters in this volume relating to the export packing of machinery, and in Captain Knowlton's and Mr. Fitz Gerald's special chapters, apply with full and equal force to the packing of all forms of agricultural machinery, and should be studied with care and attention by every exporter of the latter class of machinery. There may be little of a special nature to repeat in this chapter as applying specifically to shipments of agricultural machinery, yet it is believed that the reports and explanations which have courteously been supplied to the author by a large number of prominent manufacturers and exporters cannot fail to be of interest and value.

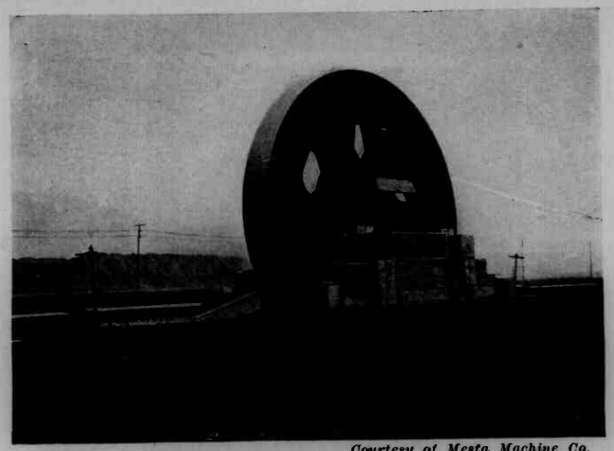
In the packing of agricultural implements great care must be taken to see that the lumber used is thoroughly cured, and green lumber should never be used. Strength and durability are two extremely important points in this sort of packing, and green lumber will be found to offer little or no security and will almost invariably lead to loss and trouble. As a general rule cases containing this class of goods are stored in the hold of the ship for transportation, the heat from the boilers and furnaces quickly dries out green lumber, and the speedy result is that nails are loosened or drawn out entirely, and the box or case either falls to pieces or is rendered practically useless. It frequently happens, when green lumber is used, that if the attempt is made to hoist the package from the hold it falls to pieces, and the only thing left of the machine can be easily shoveled from the bowels of the ship.

Every effort should also be made to pack the implements as compactly as possible so as to occupy the smallest amount of space, and for this purpose the machine should be knocked down just as far as the character of construction admits. However, when the machines are so knocked down instruction sheets for assembling must be most carefully worked out and enclosed with the package. The rural classes of foreign countries know, as a rule, little about mechanics, and if the purchaser is going to be protected to the extent of saving as much freight as possible, he should also be protected to the extent of enabling him to assemble the machine without loss of time and without being compelled to call in an expert mechanic from, perhaps, some distant point.

A manufacturing company widely known throughout the world, in sending a number of photographs illustrating its packing methods, calls attention to an article which recently appeared in *Tractor and Trailer* under the title of "Boxing Agricultural Machinery for Export." This article was written by Monnett B. Davis of the J. I. Case Plow Works Company. From it the following extracts may be quoted: "A great deal has been written concerning the proper packing of export shipments; and, judging from the reports of various trade representatives abroad, even more might be read by manufacturers with profit to themselves and to our foreign trade in general. Most writers make very sharp criticisms on methods now used, but very few suggest better methods to be substituted.

"It is our purpose to set forth in a short article a brief description of how one company packs goods to the satisfaction of their foreign customers. There is nothing new or unusual in their methods; we merely are attempting to offer a few practical suggestions for exporters who are having trouble in packing goods.

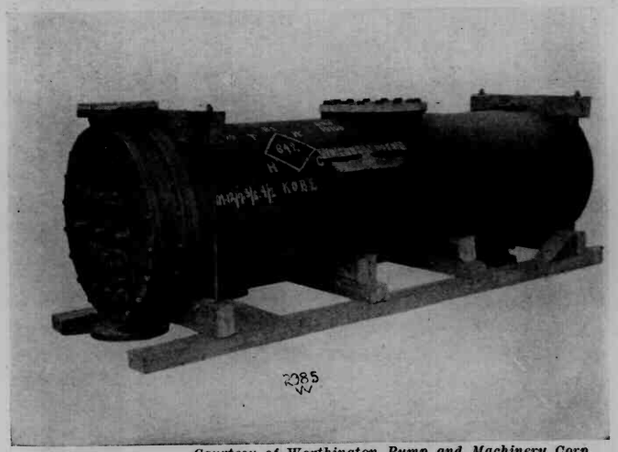
"Manufacturers in many cases do not appreciate the importance of careful packing for export. They use all care and expend real money in getting in touch with their foreign prospect and in securing the order. The steps



Courtesy of Mesta Machine Co.

PACKING OF EXTRA HEAVY MACHINERY.

It is the practice to place boards over finished bored holes and bearings and to wrap with burlap and protect with narrow strips of wood the smooth finished surfaces.



Courtesy of Worthington Pump and Machinery Corp.

PACKING NAKED GOODS.

Shows how condensers are prepared for export shipment when support saddles or feet are not cast integral with shell. This clearly indicates the method used and the reason for preparing material of this character in this manner.

PACKING OF GANG PLOW. *Courtesy of J. I. Case Plow Works Co.*

Three bottom engine gang plow, weight 960 lbs. net, 1090 lbs. gross. Case measures 16½ cubic feet. Box is just long enough to admit beams, wide enough to hold wheels, and high enough to admit remaining parts without lost space.

thus far they deem of prime importance, as indeed they are.

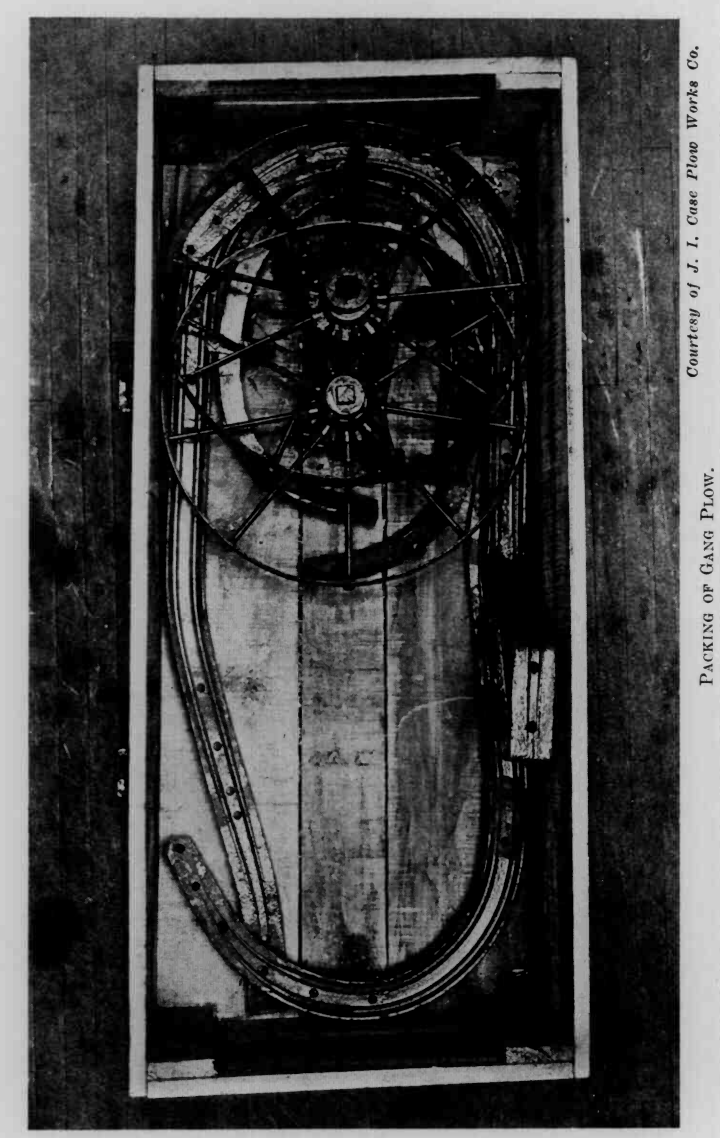
"After being advised that payment will be received for shipment at seaport this same manufacturer loses a great deal of his interest in the deal: for him the important part of the show is over. While the manufacturer's main interest is in getting his money, he must not lose sight of the fact that his customer has paid that money and that *his* main interest is in receiving the goods in good condition, so as to realize profit from them. If an exporter wishes to hold his customers it is very important that he take extreme care with each step in the transaction.

"**Pack for Safe Arrival.**—In packing goods for export the point of prime importance is to have same reach the warehouse of the foreign customer in good condition. Absolute security might be obtained by very expensive and very heavy packing; but there is another point to be watched, and that is expense involved which is borne by the customer.

"While our foreign buyers are willing and anxious to pay what is necessary to insure the arrival of goods in good condition, they at the same time appreciate every step which diminishes packing and freight costs without materially reducing security of shipment. Thus the object should be to pack goods in the smallest space and at the least expense compatible with making certain that same will arrive in foreign port in condition to be of value to the importer.

"In many cases an exporter feels that his customer is protected by insurance. This feeling is really unwarranted, as in the first place the customer has bought the goods to start doing business in a certain line; in case these goods are damaged he cannot do that even though he realizes no loss. This discourages him in practically every case and generally results in no further orders. In many cases where there is damage a great deal of inconvenience results to the importer in establishing his claim; and in many cases he must stand losses himself.

INTENTIONAL SECOND EXPOSURE



PACKING OF GANG PLOW. *Courtesy of J. I. Case Plow Works Co.*

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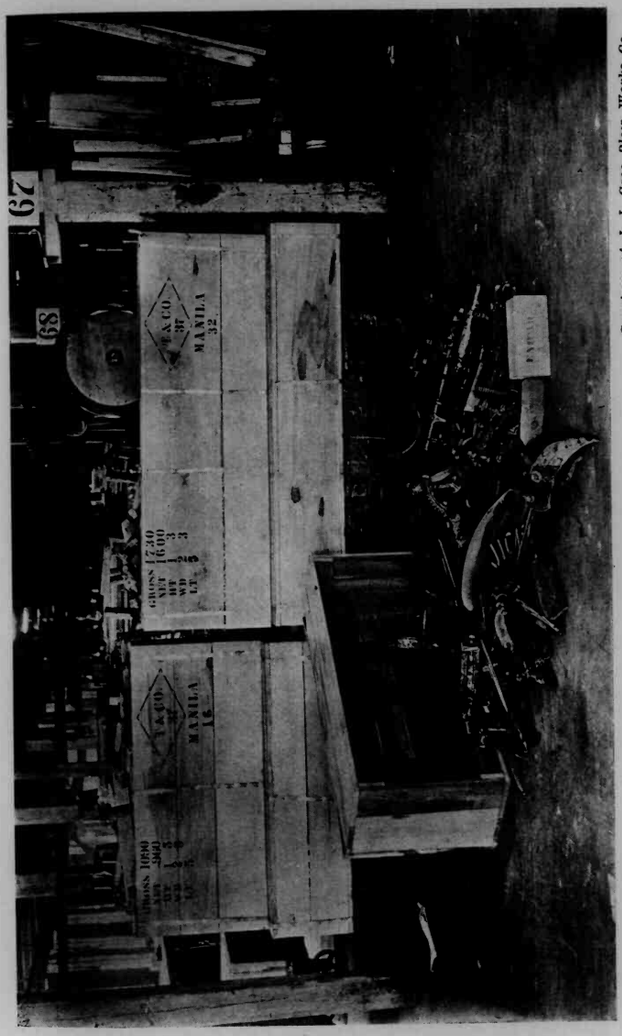
"**'Making Sure' Builds Business.**—The greatest obstacle to be overcome is inertia and carelessness. The best scheme carelessly carried out will bring only indifferent results. The most important thing is the individual who has charge of packing goods for export. This man must be systematic, careful, and above all, conscientious. In case he is inclined to 'let things go' he will lose many valuable customers for his concern. It is a fatal error to allow any machine to go out with any important part missing. It would be ten times better not to make the shipment at all.

"A very good system must be inaugurated and carried out by a careful, painstaking, conscientious man to see that every machine goes out complete. The man needed is one who will, in case of doubt, entirely unpack a machine 'to make sure.'

"We know of cases where the most serious disappointments to foreign customers have resulted from a very small but important part being left out on an expensive machine. This was done simply through inexcusable carelessness in the packing department. When such mistakes occur in domestic shipments they do not result in serious loss due to the fact that the dealer or jobber in question simply wires the factory and receives the part in a few days. In Bombay or Calcutta it would mean a season's work lost at least: imagine the effect upon the customer!

"**One Successful Plan.**—Machinery, especially, must be completely disassembled so as to pack in the smallest number of cubic feet and to prevent bending, springing or breaking of parts. To make the description very concrete, a particular implement is taken and carried through the process, mentioning the smallest details. A three bottom engine gang plow is taken as an example. This plow weighs 960 pounds net and 1,090 pounds gross. Thus it will be noted that the weight of the packing is only 130 pounds. The cubic measurements of the crated plow is 16½ cubic feet, which means 66 pounds per cubic foot. The dimensions of the box are such that it is just



PACKING OF DISASSEMBLED PLOW. *Courtesy of J. I. Case Plow Works Co.*

Box to contain plow with disassembled plow spread out before it. Straw or excelsior is used to make packing tight. Completed cases, also shown, reenforced by straps of heavy gauge band iron ⅝" wide.

INTENTIONAL SECOND EXPOSURE

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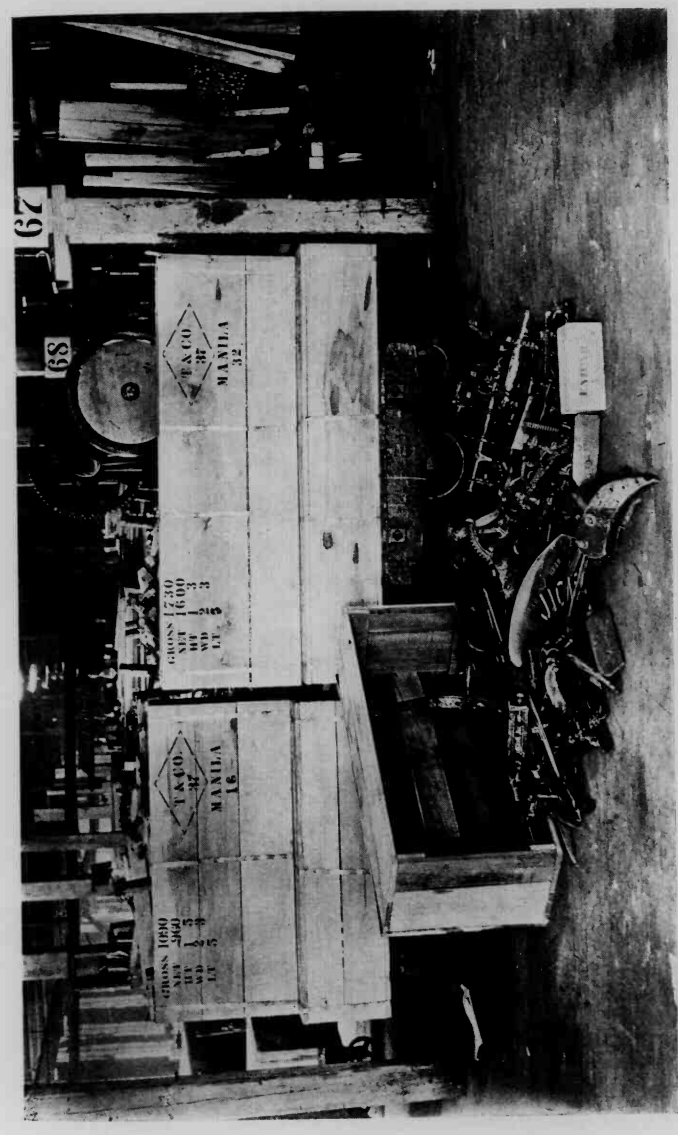

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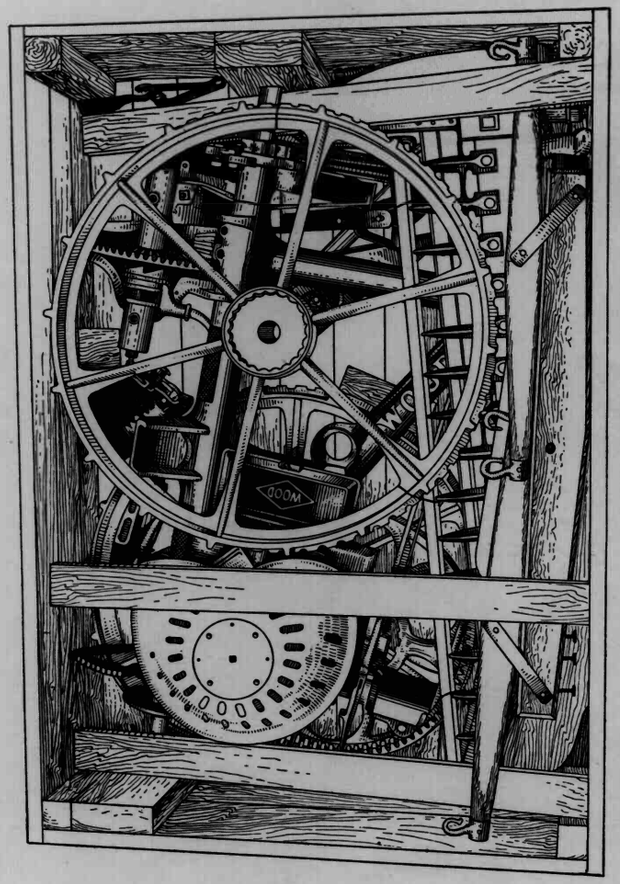


Courtesy of Walter A. Wood Mowing & Reaping Machine Company.

PACKING OF MOWING MACHINE.

This drawing shows in considerable detail the method of packing units as well as the precautions taken to hold them in place.

long enough to admit the beams, just wide enough to hold the wheels, and just high enough to admit the remainder of the parts without any lost space (see illustration, page 372). The plow must be packed in just a certain way or it will not fit in the case. A further advantage is gained in that the beams and wheels furnish very strong interior bracing.

"The boxes are made of carefully selected 1-inch gum wood which has given very good service throughout, and all nails are cement-coated. A number of additional precautions are taken to insure goods arriving in good condition and their being assembled easily. In the first place mold-boards, bolt threads and other exposed metal parts are coated with an anti-rust compound similar to that used by the United States Ordnance Department on arms, to thoroughly protect them from rust. Another precaution taken is to leave bolt in hole where it belongs with nut screwed down sufficiently to prevent its losing out.

"Many companies pack all bolts and nuts in a box together; but it has been found a very great help to men abroad, especially if they are inexperienced, to have the bolt left where it belongs, thus greatly facilitating setting up. In illustration page 375 we show box which holds the plow in question and the disassembled plow spread out before the box. In packing these parts straw or excelsior is used to make the packing tight and to prevent the parts from being damaged by too much jostling about. The completed case is shown also. After the lid has been nailed on the whole is reënforced by three metal straps. These are not the flimsy tin which is often used on packing cases and is seen even on very large boxes, but is a very heavy gauge band iron 7/8 inch wide. It is there for real service and not for looks. As above stated, plows and other implements packed as described above arrive at their destinations in very excellent condition."

Instruction Sheets.—At least one consideration in connection with exporting of agricultural machinery deserves emphasis—that is the necessity of including in every shipment and in every case very simple and ele-

mentary instruction sheets in the language of the farmers of the country to which the shipment is destined, in order that there may be no difficulties and no delays in erecting the machines by inexperienced agricultural labor, which is not often experienced in engineering or even mechanical work. Such instruction sheets should not only consist of lists of the various parts contained in each case, but should describe them, referring to them by numbers which should be conspicuously stamped in or painted on the respective parts. Machines which are dismounted should always be accompanied by drawings and photographs showing exactly how the parts are to go together, and what the whole looks like when completed. Various ways of identifying different parts may be adopted, besides the custom sometimes adopted of stenciling varicolored lines, circles or other devices across adjoining parts in such a fashion that half of the mark will appear on each part when disassembled.

Such advice applies no matter if shipments are intended for dealers, merchants, or distributors in a given market, because frequently cases containing machines in knocked down shape are forwarded by such distributors directly to their farmer customers, who may want to set up and assemble the machines immediately, without waiting for the possibly delayed arrival of the distributor's own engineers and mechanics. In any event, the more simple and intelligible the instructions given with the list of contents for each case shipped, the better the resulting satisfaction is bound to be.

Packing of Mowing and Harvesting Machines.—One of the largest manufacturers and exporters of harvesting machinery in the world writes the following interesting letter regarding its packing:

"Harvesting machines can be packed in relatively small packages, for convenience of handling. They are also constructed to facilitate compactness in packing. Our present packing is the result of long experience and the design in some measure conforms to requirements of packing. Tractors and heavy engines, on the other hand, cannot be 'knocked down' or disassembled to anything like the extent of harvesting machines, and they also have more delicately finished parts. For this reason they require different treatment in packing.

"Harvesting machines are 'knocked down' or taken apart to an extent which will facilitate packing compactly and also to make a package of convenient size for handling on a hand truck. We aim to not exceed 1,000 pounds, or less than 200 pounds. There is no object in disassembling to an extent which would increase the weight of any package over 56 pounds per cubic foot.

"We use cement-coated wire nails. This coating is important, to make the nails hold. Polished wire nails pull out very easily. There should be not less than two in the end of any board and not over 4 inches apart in wide boards. This may include the nail through band iron or corner iron.

"We use lumber surfaced one side. This gives a desirable uniformity of thickness and of cubic measurement and makes easy stenciling on more than one face of the package. The lumber is usually 7/8" or 1" rough, surfaced to 13/16" or 15/16" respectively. There must be no brash or cross-grain pieces. We use corner posts in packages—usually 2" x 2", or 1½" x 1½" for small packages.

"We use both closed boxes and open crates. We prefer crates when contents of packages are such that they can be used.

"Except for light packages, we use band iron. We use ¾" 23 U. S. gauge. The amount used depends on the size, shape, weight and construction of the package. Band iron should have one nail to each board and nails not farther than 6" apart. It is desirable to chamfer the corner of the package at the edge where the band iron goes over. On crates we frequently use corner irons or corner clips. These should extend over each side about 3" or 4"—for heavy packages, farther.

"All harvesting machines must be braced or blocked firmly to the main part of the machine in the package. This does not refer to boxes of small pieces or fixtures.

These braces should run from side to side when opportunity offers. Braces or blocks must not attach to parts which will not stand test set out below. Crates and boxes of narrow boards must usually be braced against diagonal strain.

"Long, narrow side pieces (about 1′ x 6′ or longer) must be made of 1¼″ dressed to 1 3/16″, or a thinner lumber reënforced by strips running lengthwise. All wide side pieces of flat packages should be prevented from splitting by cross pieces.

"For determining the appropriateness of any new packing, we test by forcibly pushing each over the end twice; that is to say, twice over and twice back, then over the side twice and twice back on a wooden floor. This must not damage the package or contents. The package is then dropped from a wagon-loading platform 3 or 4 feet high to a pavement or hard ground, but not a cement pavement. In this latter test the package must not be broken to an extent to let out small parts or to break parts, but the package itself may be some strained or out of shape.

"The projecting portions of heavy castings having narrow neck must be taken off, as they will break off by jarring. Grey iron extended parts must be kept ½″ to 1″ away from the covering, or the give of the boards will cause breakage. Heavy cast pieces should not rest together but must be cushioned or separated by wood brace or block.

"Angle iron sills, or projections, or malleable iron projections or shafts, can sometimes come through the covering but not beyond it. This is in order to better condense the package or to support the other parts.

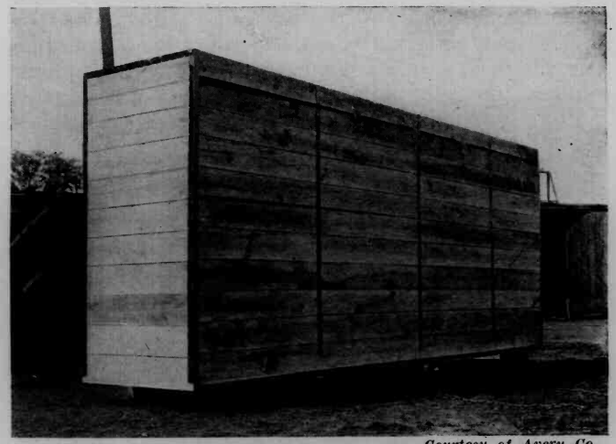
"Bright parts are protected by greasing with heavy black oil to avoid rusting in salt water transportation. Cotton duck parts are wrapped in tar paper to prevent mildew.

"Tongued and grooved boards are rarely used by us, but in some large packages are used for top and bottom boards. Some increased strength can be secured thereby

Courtesy of Avery Co.

PACKING OF THRESHING MACHINE.

Bottom of crate and five cross bars are made of 2″ x 8″ oak plank doubled. Frame and bracing are made of 2″ x 4″ yellow pine of good stock.



Courtesy of Avery Co.

COMPLETED CASE FOR THRESHING MACHINE.

Casing lumber is 1″ x 8″ yellow pine. Corner irons are made of 2″ x 2″ 26″ gauge iron. Strap iron is 2″ wide and 26″ gauge. Gross weight of case is 7560 lbs.; net weight 5796 lbs. Case measures 46″ x 92″ x 229″.

INTENTIONAL SECOND EXPOSURE

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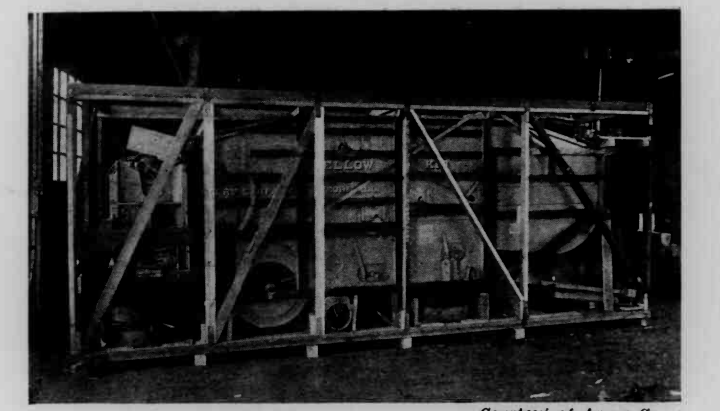
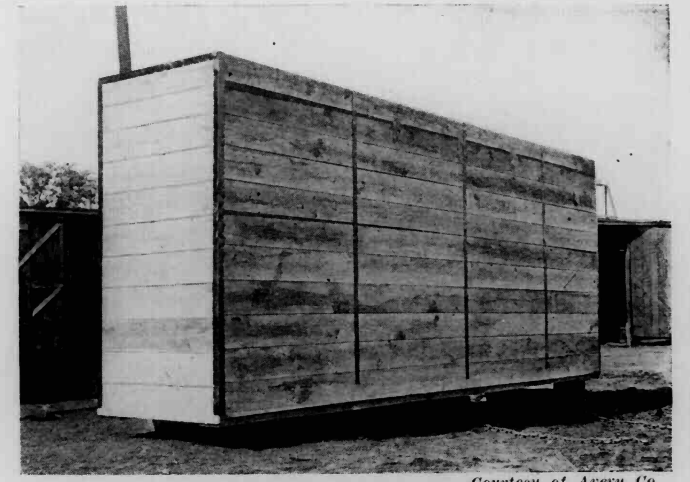


Courtesy of Avery Co.

PACKING OF THRESHING MACHINE.

Bottom of crate and five cross bars are made of 2″ x 8″ oak plank doubled. Frame and bracing are made of 2″ x 4″ yellow pine of good stock.



Courtesy of Avery Co.

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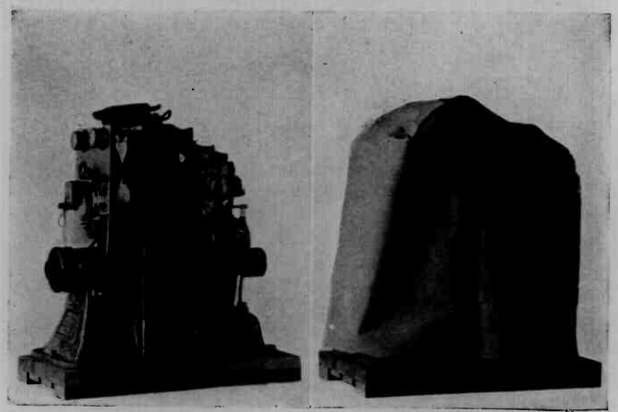
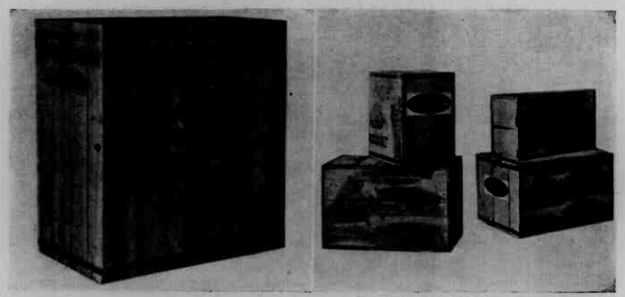


Courtesy of Litscher Lite Corp.

PACKING A FARM ELECTRIC LIGHT PLANT.

At left lighting plant complete on standard skids before packing; at right machine protected by a dust cover of heavy shipping paper.



Courtesy of Litscher Lite Corp.

COMPLETE PACKAGES FOR FARM LIGHTING PLANT.

The box shown at left is made of heavy tongued and grooved lumber and is iron strapped. Note ends of bolts which prevent shifting inside of box. At right is shown four boxes containing plant when disassembled for foreign shipment involving muleback transportation. Effort is made to keep these packages below 160 lbs. each in weight.

when it is not convenient to cross-brace underneath.

"In packing machines which are taken apart considerably it is desirable to indicate on the package box 'Open on this side.'

"Carrying wheels can often be shipped best without boxing or crating. Same applies to tongues or poles. The latter are often banded together in small multiples and thereby reduce the cubic measurement of each."

A large export manufacturer writes as follows in regard to export packing: "Our machines have been packed for and shipped into every agricultural section of the world. This, of course, has required special packing for different countries in order to meet both transportation conditions, such as muleback packing for Bolivia, or special tariff conditions in force in various countries. While we endeavor to standardize our packing as much as possible, such standardization is based upon transportation and import conditions of the country to which shipment is destined.

"As an indication of the test to which our packing is subjected, we test our packages by carrying them several flights by elevator and dropping them through the elevator shaft to the concrete floor below. The packages are then reopened and a careful investigation made to indicate just what breakage or shifting, if any, has taken place.

"To some countries we supply machines in a semi-assembled condition; in other countries very completely knocked down. In this latter event, as all parts are clearly numbered and boxes contain very detailed instruction books, the consignee has no real difficulty in assembling machines properly. We are herewith sending you an illustration of our packing for export of a mowing machine" (see page 376).

Packing of Threshing Machines.—A manufacturer of threshing machines sends us photographs, shown on page 381, and states: "Export packing is a very expensive operation just now, owing to the heavy cost of lumber and labor. In a main way, our method is as fol-

lows: We draw the entire machine with all its equipment upon a platform. We take off the axles and wheels, take out the shafting, take off the pulleys, remove the cylinder. We pack the cylinder separately, also the shafting. The pulleys and all its parts we pack inside the thresher. We also place the axles and the four thresher wheels inside the package.

"We use a 2" oak bottom, using three planks and filling in between with 1" boards; then we use 2" x 4" for the frame at the sides, some set edgeways, some flatways. We use a light grade of pine to cover the package, and it should be closed up pretty tight so that bolts and nuts will not shake out if they get loose. The main thing, of course, is to condense the package into as small a space as possible, and this can be done by putting as many of the loose parts and other accessories that are to go along with this shipment, such as belts and canvas covers, inside the main package. If there is a self-feeder to go, we pack it in a separate case.

"You will, therefore, see that the basis of the thing is to get a good solid frame which we get out of oak plank and the 2" x 4". The rest is not so material. We have some customers who want a special package and ask us to use 2" lumber, but when they find out the present cost, they generally change their mind.

"To give you an idea of the size of the ordinary thresher, we may mention the dimensions of our 32 x 52 machine. This machine with self-feed and wind stacker weighs, gross, 13,930 pounds, net 10,420 pounds, and occupies 1,226 cubic feet. The largest package in the shipment measures 72" x 97" x 271", 1,090 cubic feet, and weighs 11,180 pounds.

"In starting to pack a new machine, we first dismantle the machine and get it as near the shape we want to pack it as possible, then taking its measurements, cut our lumber. If, after packing one machine, we find we can still further reduce the package, we do it. Our foreign packing department has standing instructions to always be figuring on making packages smaller if possible."

Packing of Windmills.—The following extract is from an interesting letter of a large manufacturer of windmills: "Windmill towers consist of the following parts: anchor posts; iron corner posts; iron cross girts; braces (wire rods); ladder for climbing tower; wooden platform.

"If only one mill and tower are packed per order, the angle-iron corner posts of the tower are each made up of ten-foot lengths, the number depending upon the height of the tower. These lengths are placed with their angles fitting into one another, and the wire braces are packed inside, their ends being bent over, so that they will not exceed the height of the posts. All are tied together at top and bottom with wire, and the address tag is tied on with wire. The bundles are also marked with white paint. The iron cross girts are tied similarly into a separate bundle, and another bundle is made of the four anchor posts, which are to be anchored in the ground. The ladder, also, knocked down into lengths whose number depends upon the height of the tower, is bundled similarly. The bolts and washers are packed in a box. The wooden platform is crated separately.

"Windmills: the vane sheet is packed in a crate. The fans and arms, which are knocked down into from four to eight sections, are packed in another crate, one section on top of another. The bolts and other fixtures go in one box; the central ironwork in another box.

"If several mills and towers are packed for same order, the towers, being compact in bulk, are rated on a weight basis; therefore they are packed in the same way as above, without any effort to reduce the measurement. The wooden platforms, however, are crated several in a box.

"The mills are so packed as to include as nearly as possible one long ton of weight per 40 cubic feet of measurement, for the steamship company, having the option of basing rates on weight or on measurement, counts 40 cubic feet to a long ton. If the measurement per ton exceeds this, the company will naturally choose

to charge by measurement and therefore the shipper will have to pay for more than the actual weight. Therefore, shipments are made as follows, wherever possible: six 6-foot mills; five 8-foot mills; three 10-foot mills; two 12-foot mills. Space is saved by knocking down the fans entirely, so that one lies perfectly flat upon the other, and a very small crate can be used.

Farm Electric Light Plants.—An experienced manufacturer and shipper writes: "Our product is a farm or rural lighting plant, consisting of a gasoline engine mounted upon the same base with an electric generator, switchboard and radiator. We are sending photographs we have had prepared for you, showing our method of packing these plants for export shipment. You should note that whereas we pack in open crates for domestic shipment, we invariably use tight boxes for exporting. All plants are mounted on skids—which form the base for both domestic and export shipment—and are built up on 2″ x 4″ and 2″ x 6″ lumber.

"We usually ship these plants in integral units, but sometimes have to disassemble them for countries of mountainous character, where the cases have to be transported on muleback. We then make an effort to keep packages below 160 pounds each, as, for example, in shipments to Colombia. Photographs (see page 382) illustrate the plant in a single case, and precisely the same plant dismounted and packed in four cases. These four small cases have the following measurements and weights:

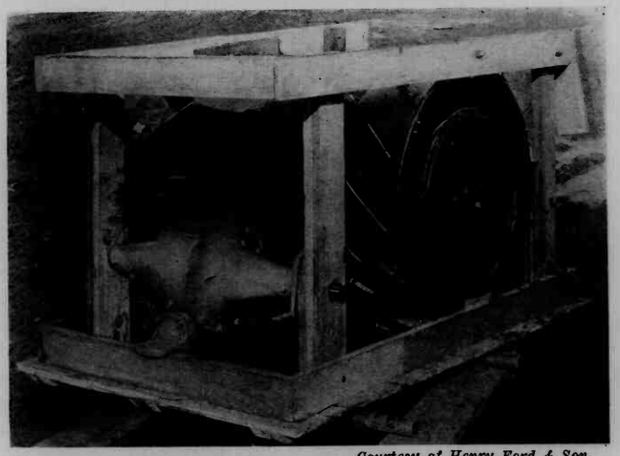
1 case —15″ x 21″ x 23½″	weight.....166 pounds
1 case —18″ x 21″ x 33″	weight.....147 pounds
2 cases—each 11″ x 17″ x 30½″	weight. each138 pounds

We believe that you will agree with us that these pictures present evidence of good packing for export.

"Our plants are bolted to the base with 3½″ bolts, to prevent shifting inside of the case, which is constructed of 1¼″ x 5″ x 39″ matched, close fit lumber, usually

Courtesy of Henry Ford & Son.

PACKING OF AGRICULTURAL TRACTOR.
The first stage of packing, without the wheels.



Courtesy of Henry Ford & Son.

METHOD OF PACKING TRACTOR WHEELS.
The wheels and motor are packed together. Note that motor is covered with waterproof cloth.

INTENTIONAL SECOND EXPOSURE

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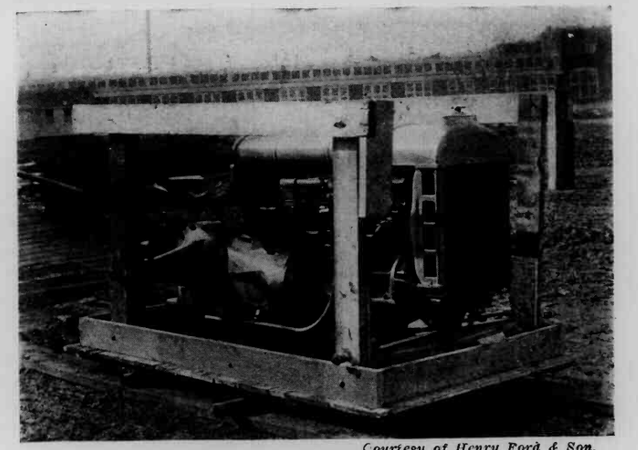
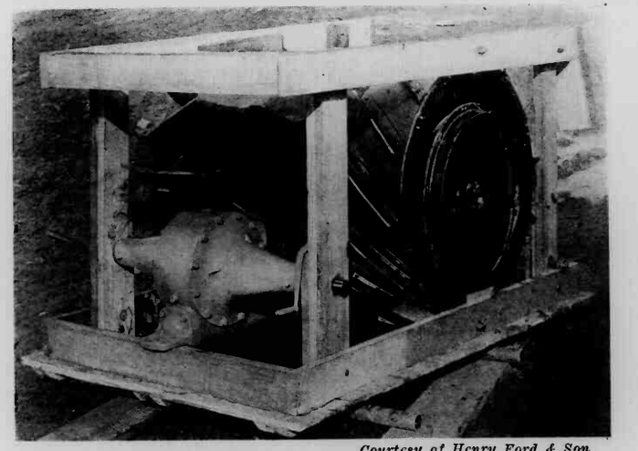


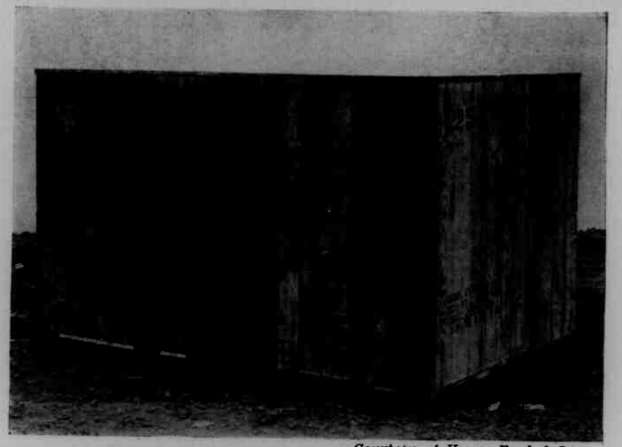
Courtesy of Henry Ford & Son.

PACKING OF AGRICULTURAL TRACTOR.
The first stage of packing, without the wheels.



Courtesy of Henry Ford & Son.

METHOD OF PACKING TRACTOR WHEELS.
The wheels and motor are packed together. Note that motor is covered with waterproof cloth.



Courtesy of Henry Ford & Son.

COMPLETED CASE FOR TRACTOR.

Note marks showing weights and linear and cubic measurements.

Courtesy of Cleveland Tractor Co.

METHOD OF BOXING TRACTOR.

Whole tractor is boxed as it stands, and consumer has very little assembling. Delicate parts, magnetos, etc., packed separately. Box is lined with waterproof paper, strongly reënforced, and all parts cleated down. Case is iron strapped. Attention is called to size of case and cubic contents indicated by marks, which are not export marks but have been made merely to illustrate packing methods.

hemlock or pine, and securely strapped with heavy band iron.

"We would call your attention to the smeared appearance, in the photograph, of the lettering in the marking. This is due to the reflection of the light on the gloss of the shellac with which all of our marks are covered, to make them permanent. Actually the lettering is perfectly clear.

"Like many American manufacturers, it took us some time to learn how properly to pack for export, and it was not until several of our shipments had been damaged that we learned that it paid to put extraordinary careful and strong work on all export packages."

Packing Agricultural Tractors.—According to a recent issue of the *Wall Street Journal,* the production of agricultural-type tractors in the United States during the year 1920 is estimated at 300,000. This compares with 175,000 produced in 1919 and 7,450 in 1913, the first year in which small agricultural-type tractors demonstrated their efficiency and worth to the farmer. Thus in the brief span of seven years we have an increase of some 4,000 per cent.

We believe that the increase in production of tractors will obey the same law as the increase in automobiles, and that the argument for the increase in the two cases has a very close analogy. During the infancy of the automobile industry predictions were constantly made that the saturation point would soon be reached, and then we should have a decline in the number of cars turned out and a decided restriction in the maximum production. However, as time went on it was seen that the automobile was essentially a transportation element, and that the number in use could only be measured by the transportation needs of the different sections of the world. As these transportation needs, however, are constantly expanding, both from the standpoint of the individual and from that of commerce, it has been impossible to set bounds for them, and gradually the conviction has become fixed that it is not possible to set a limit either in

time or quantity for the number of cars that the world will require and purchase.

The tractor offers the same problem, for it is equally impossible to predict the volume of the demand that will be created by the progress of agriculture and the increased enlightenment of the farming classes. As the production of automobiles will respond to the broadening of transportation needs, utilization of motor express lines, expansion of the good-roads movement, so the tractor will obey the laws of expansion in agriculture and the necessity confronting the farmer of relying more and more upon machinery for the planting, care and reaping of his crop.

Tractors are made in many different sizes and in a large number of types, although it would seem that the greater demand will be for the small, less expensive machines, as the same has been true of the small, inexpensive automobile. A house doing a large international business in small tractors sends three interesting photographs, pages 387 and 388, which are self-explanatory.

A house making a small machine sends a photograph (see page 388), and states: "We believe we cannot do better than enclose you herewith a photograph of the boxing as used by us, which has proven eminently suitable for overseas shipment. In this particular case the whole tractor is boxed as it is, and the consumer has very little assembling to do in order to have his machine ready for work. The delicate parts like magnetos, etc., are packed separately in waterproof and greased material, and the whole inside of the box is lined with waterproof paper, strongly reënforced, and all parts are cleated down. We have had occasion to ship many hundreds of these tractors abroad, and the complaints about packing have been practically nil."

This manufacturer states that the case shown is iron-strapped, and attention is called to the size of case and cubic contents, indicated by the marks. Of course these marks are not export marks, and are merely for the purpose of illustrating packing methods.

An internationally famous company, which has shipped thousands of tractors to many parts of the world, sends photographs (see pages 393, 394 and 397), and writes: "For engines or tractors or for heavy machinery which makes a package of over about a thousand pounds, which, therefore, is not suitable for handling on a warehouse truck, we pack on skids for moving on rollers. Tractors are shipped nearly set up, though the carrying wheels are removed.

"For our 8/16 HP tractor we use two sills, 4″ x 6″, of hard maple for skids. Cross pieces are bolted thereto, the heads of the bolts being counter-sunk in the bottom of the sills. The cross pieces are covered with a maple floor. Yellow pine uprights measuring 2″ x 6″ are nailed with 40-penny nails to the ends of the cross pieces. Top stringers and top cross pieces are provided of the same material. All is covered by maple sheathing and reinforced by band iron. Cross pieces are run from side to side where convenient. The engine must be firmly bolted to the skids or flooring; nothing is hung to the sides of the box.

"All bright or finished parts are covered with waterproof paper, reënforced with gauze; 10-penny nails are used in sheathing; 8-penny nails in banding. Carrying wheels are shipped loose with boards attached for stenciling."

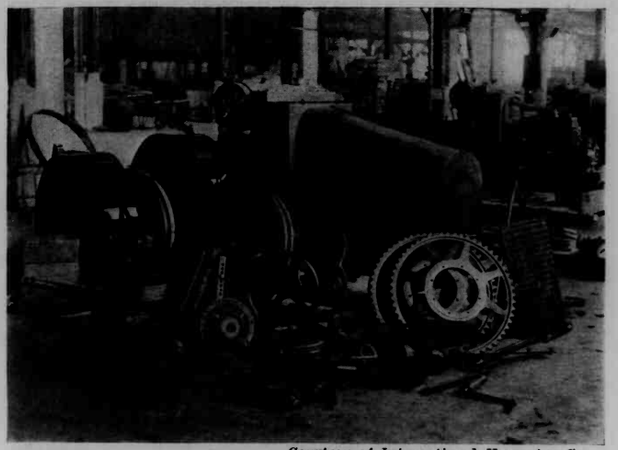
A large manufacturer and shipper sends the following brief description of his packing procedure: "The implement or tractor, completely assembled, is forwarded to the boxing department. Here it is carefully inspected to make sure that everything is in order, and then disassembled. Instead of the bolts and other parts being packed loosely in the box, each bolt and nut is put back into its proper place. All exposed and polished surfaces are coated with a special anti-rust compound. The parts are next packed in excelsior, in specially designed boxes, which are made of carefully selected gum-wood planking of ½″ thickness. Cement covered nails are used throughout. After the parts are carefully packed in excelsior

in these boxes, three complete sets of setting-up instructions are then placed in the box, before the top cover is nailed on. These setting-up instructions are translated into French, Spanish, Portuguese, Italian, etc., and instead of going into a lengthy description as to how each part is assembled, it has been our policy to show excellent cuts of photographs. After the top cover has been nailed down, the box is then banded at intervals of 2½′ with heavy gauge band iron, ⅞″ wide. This is tightened by a special tool made for that purpose.

"The description of the boxing methods on our tractor is clearly explained in the attached article. We might add that this tractor crate is lined on the inside with several thicknesses of tar paper. We are now using double deck planking, as our experience has shown us that when single deck planking is used water will sometimes leak through the top and remain on top of the tar paper lining, until the rolling of the ship, or whatever conveyance is being used, gradually works the water through the wrapping of the tar paper."

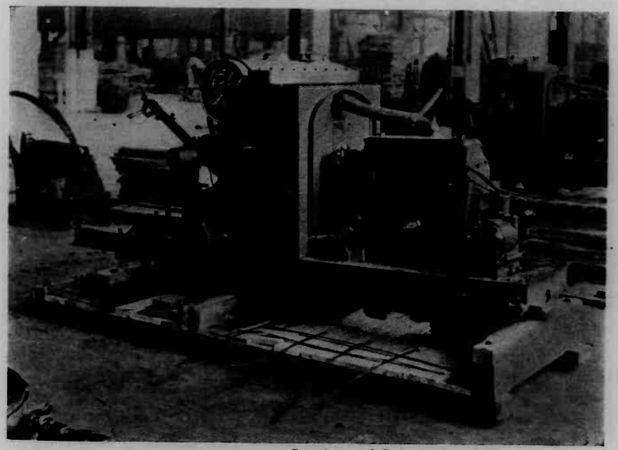
The following is an extract from the article referred to in the last paragraph, which, together with quotations appearing in the earlier portion of this chapter, was published in *Tractor and Trailer:* "In packing the tractors the same care is used about little things as in the line of implements. The main thing in packing big machinery, as in everything else, is the degree of care used. The most careful, conscientious and painstaking man in the shop should be put in charge of packing shipments for export.

"The illustration, page 397, showing a tractor in skeleton crate, shows very clearly method of packing this machine. It is particularly necessary to have the tractor thoroughly braced in the crate so that however the crate may be stowed away the tractor and dismantled parts will keep their places. Care must also be taken that machine is packed so as to avoid a strain on any particular part. The crate is just wide enough to admit the front part of chassis with drive wheel on either side.



Courtesy of International Harvester Co.

TRACTOR KNOCKED DOWN WITH PARTS DISASSEMBLED READY FOR EXPORT PACKING.



Courtesy of International Harvester Co.

PACKING DISASSEMBLED TRACTOR.

Shows base, or skids. The hood has been removed from the engine.

INTENTIONAL SECOND EXPOSURE

in these boxes, three complete sets of setting-up instructions are then placed in the box, before the top cover is nailed on. These setting-up instructions are translated into French, Spanish, Portuguese, Italian, etc., and instead of going into a lengthy description as to how each part is assembled, it has been our policy to show excellent cuts of photographs. After the top cover has been nailed down, the box is then banded at intervals of 2½′ with heavy gauge band iron, ⅞″ wide. This is tightened by a special tool made for that purpose.

"The description of the boxing methods on our tractor is clearly explained in the attached article. We might add that this tractor crate is lined on the inside with several thicknesses of tar paper. We are now using double deck planking, as our experience has shown us that when single deck planking is used water will sometimes leak through the top and remain on top of the tar paper lining, until the rolling of the ship, or whatever conveyance is being used, gradually works the water through the wrapping of the tar paper."

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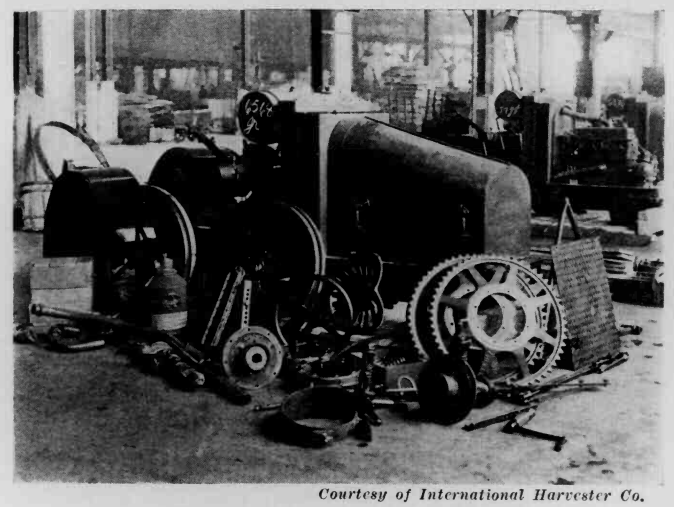

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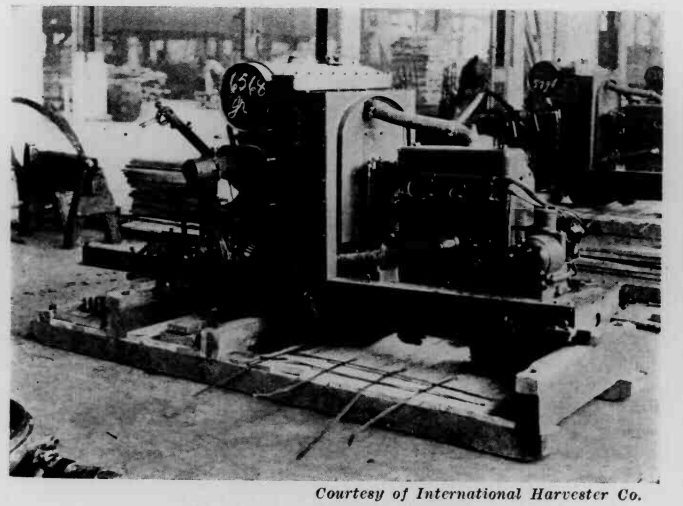

Courtesy of International Harvester Co.

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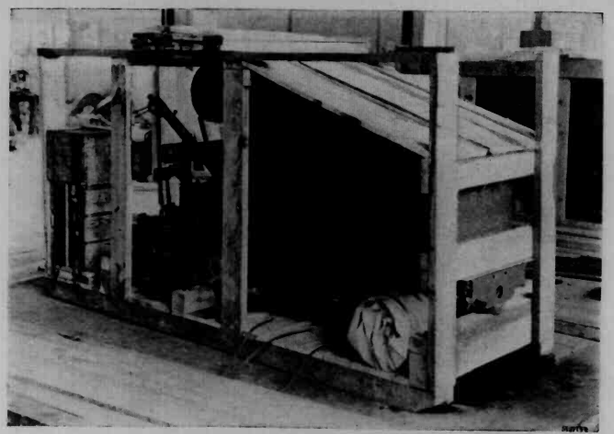


Courtesy of International Harvester Co.

FRAMEWORK OF SIDES AND TOP OF CASE FOR TRACTOR.

Tractor is attached to base. Note method of placing boxes containing small parts.

Courtesy of International Harvester Co.

METHOD OF PACKING PARTS OF TRACTOR.

Carrying wheels and other parts have been inserted and attached to base.

The length of course is the extreme length of the tractor with wheels removed, and height the diameter of drive wheels. This tractor packs in 208 cubic feet, which results in a very appreciable saving in freight to the importer.

"Every precaution is taken to prevent the tractor being injured by exposure to the weather and sea water. The tractor is first placed in skeleton crate and thoroughly braced; then covered with heavy grade tar paper and finally boxed, as shown in illustration, page 398."

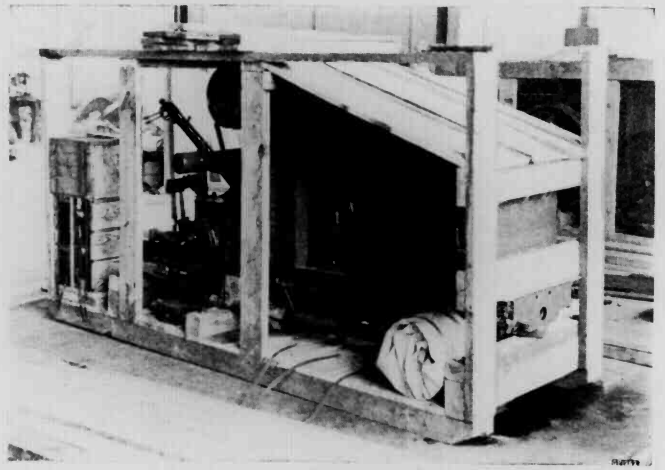
Another prominent manufacturer writes: "The problem of packing tractors for export shipment begins at the time the machines are knocked down in the factory, and ends only when they are reassembled at their foreign destination. The tractor must be sufficiently taken apart as to permit compact packing. At the same time no unnecessary part must be taken off. The tractor must be so packed and crated that it will arrive in good condition without breakage or loss." See photographs supplied by this house, pages 398, 401 and 402.

"All machine parts must be so protected by the use of heavy slushing oil that there can be no corrosion of the metal by salt air. Precautions must also be taken against rain and impromptu duckings.

"Arriving as it does at its destination in a knocked down condition, it follows that reassembling at the dock or warehouse is the first step to be taken, and in order that loss of parts or mistakes in erection cannot occur, a careful system of checking-in the removed parts and a carefully explained process of reërection must be sent along with the tractor.

"**Knocking Down.**—The tractor is run in on the shipping floor; the hood and spark plugs are removed; the cylinder head pan is taken off and heavy slushing oil worked into the valve seats and cylinders, over the bearings and down the valve guides, and on every machined surface. On all other exposed places not covered by paint, a special slushing grease is smeared thickly. These precautions are taken as a protection against the damp

INTENTIONAL SECOND EXPOSURE



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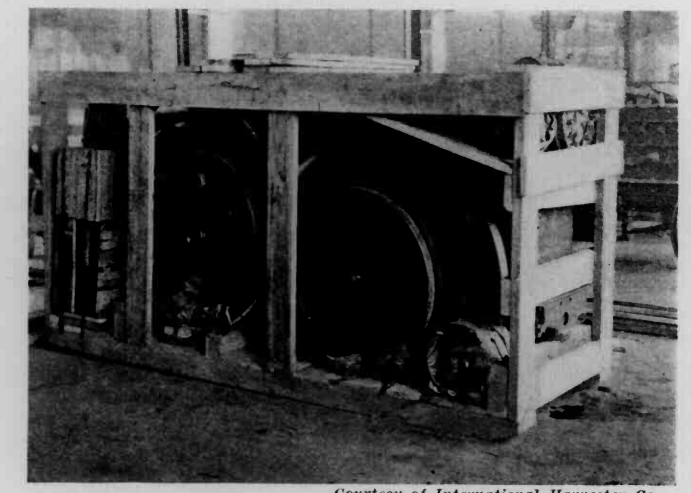

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sea air and moisture. The fan belt, spark plugs, steering wheel and levers are then removed and packed securely in boxes. The wheels are taken off and the naked frame with the motor is placed in the crate. The wheels are placed alongside as shown in the photograph (page 401), and the boxes of parts stowed away. Around the engine is wrapped a double thickness of heavy tar paper, which is securely tied.

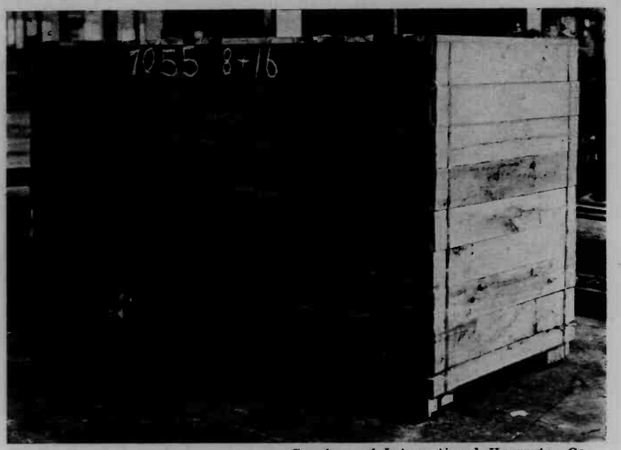
"It is obvious that such a heavy piece of machinery requires an extra strong crate to protect it from the hard knocks of handling by cranes and winches.

"A brief description of the crates in which Twin City '12-20' tractors are packed might not be amiss. The bed pieces of the frame are three heavy four by sixes, running lengthwise and tied by three half-inch tie rods. The flooring, which is two-inch planking, is nailed securely to these stringers. On top of this planking is placed a double thickness of tar paper. The uprights of the crate are then placed in position and securely bolted, and the top cross pieces put on; tar paper is then tacked on the outside faces of the uprights and the case sheathed up over the tar paper with one-inch dressed and matched lumber, thus making the whole thing water-tight and almost air-tight.

"**Markings.**—The boxes containing removed parts are placed on the inside of the crate, are marked with a list of the materials they contain, while the outside of the crate is labeled with very great care. The number of the box, its cubic contents in cubic feet and cubic meters, its weight in pounds and kilograms, the gross tare and net in pounds and kilograms, its destination and the consignor, also the notation 'For export-lighterage free,' are placed conspicuously."

The originators of the caterpillar type of tractor supply the author with an elaborate book covering their packing procedure, and from the general instructions issued by this company the following quotations are made covering the most important sections of the same:

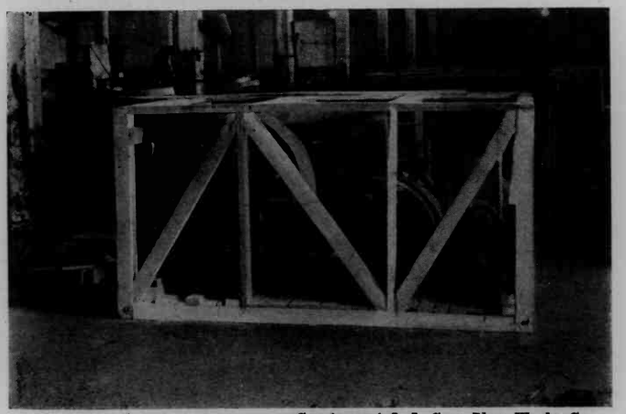
"1. (a) When disassembling the tractor as many as



Courtesy of International Harvester Co.

COMPLETED CASE CONTAINING DISASSEMBLED TRACTOR.

Shows the complete package, including banding.



Courtesy of J. I. Case Plow Works Co.

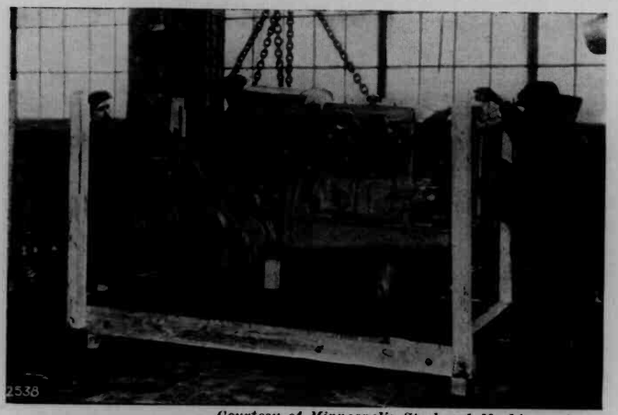
TRACTOR IN SKELETON CRATE.

The tractor must be thoroughly braced so that however the crate may be stowed away, the tractor and dismantled parts will keep their places. Care must be taken that machine is so packed to avoid undue strain on any one part.

Courtesy of J. I. Case Plow Works Co.

FINAL BOXING OF TRACTOR.

After being placed in skeleton crate and thoroughly braced, the tractor is covered with heavy grade tar paper and boxed. The box is now ready for strapping.



Courtesy of Minneapolis Steel and Machinery Co.

ANOTHER METHOD OF PACKING DISASSEMBLED TRACTOR.

A disassembled machine which has just been lifted into the partly built case by means of the overhead crane shown in the picture. For greater ease in loading, only one side of the case is built up.

possible of the small parts of assemblies, also bolts, nuts, washers, etc., will be replaced on the assemblies from which removed, and when so placed must be securely tightened or fastened so they will not jar off.

"(b) When it is impossible to replace such parts as outlined above, owing to interference in crating, they should be placed in cloth shipping sacks, or wrapped if too large to be put in sacks, tagged so as to be properly identified, and then be tied or fastened as near the location where they belong as possible. In cases where the twine or cord is likely to be cut or become broken, the tags should be wired to the assembly.

"(c) If the above referred to parts are finished or machined, they must be slushed with slushing compound to prevent rust.

"2. All finished or machined metal parts on all assemblies will be thoroughly slushed with slushing compound (a composition of heavy oil and white lead) before packing to prevent rust or corrosion. This is of prime importance, as it must be borne in mind that portions of the hold of the ship are at best extremely damp and machinery for export traffic must be protected against rust and damage due to water and dampness.

"3. Boxes containing all assemblies, which might be damaged by rust, will be lined with tar paper as an extra precaution against dampness.

"4. As a means of assisting in reassembling, a duplicate set of numbered tags will be used. After the disassembly is made and part removed, such parts will be tagged with one of the duplicate numbered tags; the corresponding duplicate numbered tag will be attached to the place where the part was removed from. Tags will be fitted with wire fastenings and not twine fastenings.

"5. Before starting the disassembly of the tractor, the carburetor, gasoline tanks, radiator and cooling system must be entirely drained and the long red tag marked 'CAUTION' attached to the motor.

"6. Inspection plates on the motor will be removed and the connecting rods, crankshaft, and other interior

INTENTIONAL SECOND EXPOSURE

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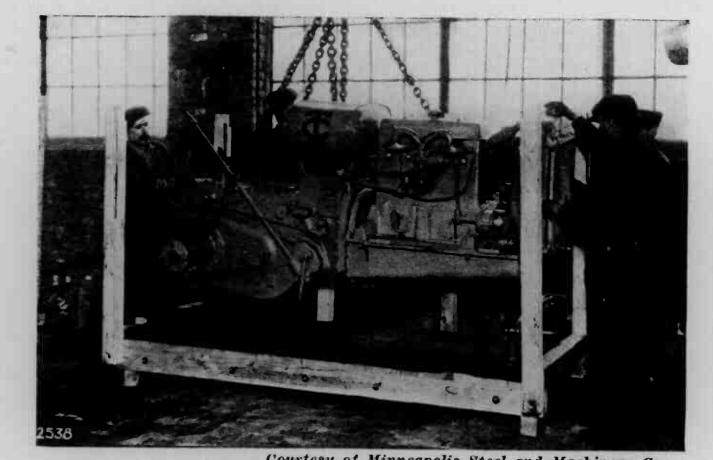

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"6. Inspection plates on the motor will be removed and the connecting rods, crankshaft, and other interior

parts will be given a coating of slushing compound, also a pint of heavy cylinder oil will be placed in each cylinder through the spark plug holes. The small red tag marked 'IMPORTANT' will be attached to the motor, saying this has been done.

"7. All air openings into the motor or transmission must be filled with wooden plugs or be stuffed with burlap and wrapped with 'Kraft' paper, so as to prevent any dampness reaching the interior parts.

"8. Specifications of 'Kraft' paper: Paper should be 100 per cent sulphate 'Kraft' paper, weighing approximately 60 pounds to the ream of 480 sheets, 24″ x 36″, coated with asphalt and reënforced with cotton cloth of approximately 16 thread to the inch in each direction. This paper should weigh approximately 34 pounds to the 100 square yards. Such paper will be entirely waterproof and have strength of not less than 60 pounds, tested on Mullen tester.

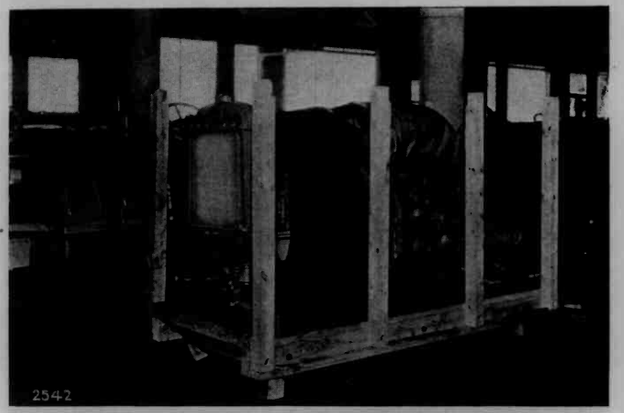
"9. Marking packages: Each package will be plainly marked with stencil or brush, unless specific directions are given to the contrary on the shipping order. Never use shipping tags, as they are easily torn off in handling.

"10. Numbering packages: Whenever a shipment embraces more than one package, each package in the shipment must be numbered consecutively. This point is important, as numbers must be shown on all documents and bill of ladings relating to the shipment, such being one of the principal means of identification used by the steamship company when loading and discharging cargo.

"11. Reënforcing with strap iron: (a) Each box when nailed will be, if built on skids, strapped from bottom, up sides and across the top, and also from bottom, up the ends and over the top, with strap iron nailed to the box; strap iron to be placed at least 1″ from the end is preferred.

"(b) If box is not built on skids, the strapping must extend entirely around the box, both lengthwise and around the ends.

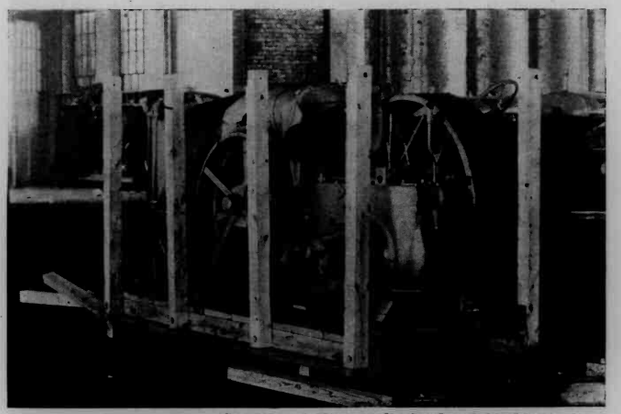
"12. After the assemblies have been placed in the



Courtesy of Minneapolis Steel and Machinery Co.

SECOND STAGE OF PACKING DISASSEMBLED TRACTOR.

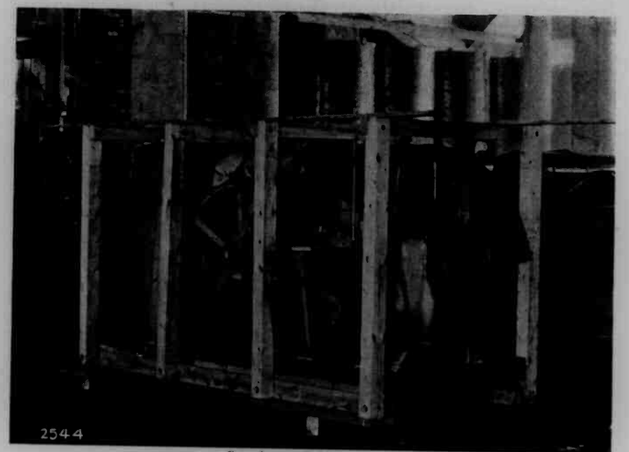
The same machine after the parts have been slushed with oil and the engine has been wrapped with double thickness of tar paper, firmly tied with rope.



Courtesy of Minneapolis Steel and Machinery Co.

METHOD OF PACKING TRACTOR WHEELS.

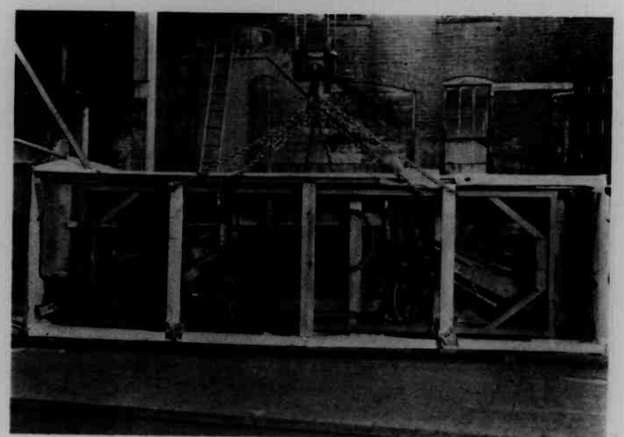
The wheels are packed in beside the tractor. In the back are the two large hind wheels, and in foreground is one front wheel, the second front wheel lying beneath the other. The small wheel is a belt pulley.



Courtesy of Minneapolis Steel and Machinery Co.

TRACTOR CASE READY FOR SHEATHING.

All parts have been packed in around tractors and other side of case has been built up. Note box containing tools and spare parts in foreground.



Courtesy of Troy Wagon Works Co.

TRAILER BOXED FOR EXPORT.

The trailer is shipped knocked down. Boxes bound with 1" No. 22 strap iron, nailed on. Corners are reënforced with No. 14 sheet steel.

crates, all places which should be painted (but were not covered at the time the spraying was done) will be painted with a brush; also all parts of the assembly marred in making the disassembly will be re-painted with the brush.

"13. Tools and spare parts: Tools will be packed in a box made of 1" material, 20½" long, 16¾" wide and 14 ¾" high; and spare parts will be packed in two (2) boxes made of 1" material, one of which is the same size as the tool box and the other size 41" long, 10" wide and 9" high."

Hand Plows.—A large exporter of hand plows gives us the following information regarding packing for export shipment:

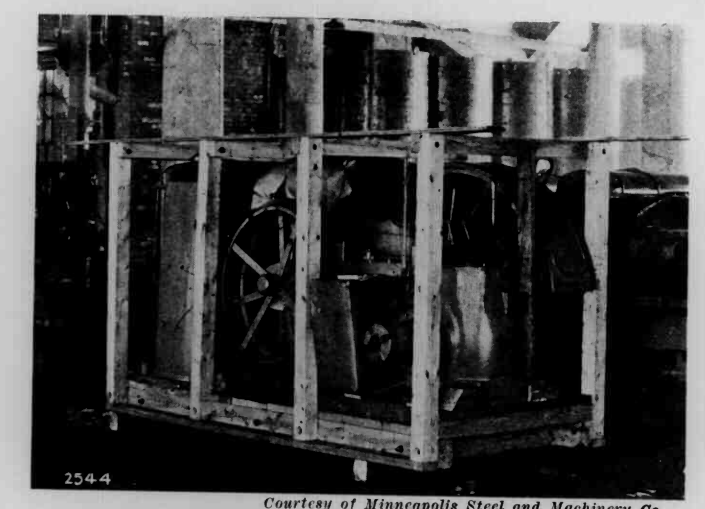
"In packing plows for export shipment we always knock them down completely or disassemble all parts. The plow bottoms proper, which consist of the standard, mouldboard, share and landside, are usually packed in one case, placing about six of these bottoms in one box. Prairie hay is packed between the parts so as to prevent breakage. We have found this to be the best material that we can get hold of for this purpose, as it will not move or shift around in the box like shavings or some other materials that are sometimes used. The hay is very tough and even when the cases are occasionally subjected to rain or weather conditions, this hay remains just the same as when placed in the cases.

"If the plows are fitted with steel beams, we usually pack the beams for six or twelve plows in a case and the wood handles in another case, so that the iron parts will have no chance of scratching the paint on the wood parts.

"If the plows are fitted with wood beams, the usual custom is to pack the handles and beams in one case. When there are nothing but wood parts in a case no hay, of course, is required as everything is packed tightly and if necessary, cleats are nailed in the cases so as to keep everything in perfect position.

"The cases themselves are made from good quality

INTENTIONAL SECOND EXPOSURE



Courtesy of Minneapolis Steel and Machinery Co.

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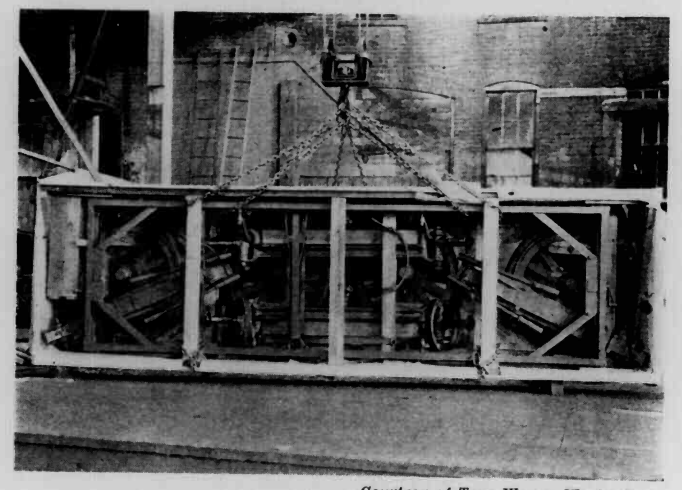

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pine crating or boxing lumber of one inch in thickness. Occasionally it is necessary to use some hard wood lumber where a little more weight than usual is to be placed in the cases. You will note that they are cleated at the corners on each end, giving strength and also providing better facilities for fastening on the lid. All cases, which are five foot or more in length, especially if considerable weight is placed in them, are also provided with cleats in the middle on the inside of the cases, on both sides and the bottom.

"All cases are bound with heavy strap iron and extremely well nailed. The small cases are bound on each end with strap iron, while the longer ones are also bound in the middle and if exceptionally long we place two bands of strap iron in the middle, making four altogether.

"The average weight of our cases is around 400 pounds gross and they very seldom weigh more than 650 to 700 pounds. For the West Coast of South America the cases, of course, are somewhat smaller and we always follow closely the wishes of our customers when they want the weight held down to the minimum on account of having to carry the cases over the mountains on mule-back.

"We have in charge of our export packing department an old and experienced employee, who takes a special interest in the business and a special pleasure in seeing to it that all goods reach destination in the same condition they leave the factory."

Another large shipper writes us:

"We use double end cases built of North Carolina or Georgia pine, and banded with hoop iron. In packing the boxes we are careful to see that there are no bulges in the middle, as these will bring the weight of the cargo unnecessarily upon the contents of the box, and result in breakage without any apparent cause. Normally, we pack 3 plows in a box, but the small plows go 6 in a box, and the heavy contractor's plows 2 in a box.

"The plows are set up complete with the exception

of the handles, and are then knocked down, all of the parts of the plow being together so that every plow can be assembled with the same parts. While it is true that plow parts are interchangeable, it is not possible to assemble and polish them, and after tearing them down, to build them from parts at random, and have them look as well as the original plow. The iron and steel parts are packed in excelsior, and the wood parts are protected from damage through contact with the iron parts by a thin strip of wood. The handles are included, so that each box contains all the parts to complete the plows.

"We endeavor to keep the boxes to within the limit of about 450 pounds, as our experience shows that heavier boxes show a great increase of breakage."

In connection with this information the photographs reproduced together on page 409 will be found of interest. Cut No. 1 shows a box of plow parts before being nailed up. The use of prairie hay for packing between cast parts or between steel and wood parts to prevent scratching of painted surfaces will be noted. Before the box is finally nailed up additional hay is put on top and the case is filled as full as possible. Cut No. 2 shows a carload of goods all boxed, packed, stenciled and marked and ready for loading.

CHAPTER XV

THE PACKING OF HARDWARE, TOOLS, AUTOMOBILE ACCESSORIES, SMALL APPARATUS

IT is very probable that one of the very important reasons for the success that has attended American export trade in hardware and tools has been due to the character of the packing and the care with which the firms most prominent in the work have distinguished their export effort. The neat, carefully wrapped and cartoned American tool or fine hardware is a delight to the foreign merchant and is constantly winning us good grace and favor.

The character of the American export package is in direct contrast to the European method, and this is fairly surprising in view of the care with which the European export package is usually looked after. The fact is, however, that the continental manufacturers usually ship tools either loose or uninvitingly wrapped in brown paper, and the merchandise hardly graces the merchants' shelves when once it has been unpacked and piled up as best the situation permits.

It is not alone the neat carton that commends the American package of tools or hardware, it is also the well considered export case in which the goods are placed. The best practice of the United States has developed an excellent export case for this class of goods, and the man abroad who takes his exercise along the docks from time to time is more than once pleased to note many excellent cases with the name of some well known American manufacturer of tools or hardware stamped thereon.

Character of Complaints.—However, no American manufacturer of hardware or tools and similar goods should delude himself into the belief that his packing is

necessarily perfect. Not a few complaints are constantly being received from foreign customers of American manufacturers as to the unsatisfactory condition in which various commodities are received. For example, a letter from a large New York export merchant specializing in the shipping of hardware and tools reports several complaints recently received. One from Australia referred to the light, frail cases which many American manufacturers use and the soft woods employed for making the cases which are not at all suited for the long sea journey. Another complaint received by this merchant from customers in India refers to the same characteristic of some American packing, that is, cases too light and iron banding both too narrow and too light weight. Furthermore, the Indian customers of the New York exporter declare that there is a very large breakage of iron castings due to the totally insufficient use of excelsior or other stuffing material.

Other complaints of the way in which some American hardware is shipped are voiced in a letter on this subject from another export merchant, who declares that his foreign customers very frequently complain of the poor quality of the cardboard boxes which are used for containing shelf hardware, padlocks, etc., which frequently arrive torn or crushed. This is attributed both to the fact that the cardboard used is too light in weight and to the fact that the cartons are not quite filled, leaving empty spaces which make crushing almost inevitable, besides permitting the contents to rattle about. If cartons are not quite full they should be firmly wadded with tissue or waste paper. Of course, damage to a cardboard box which is intended for shelf display purposes is quite a serious handicap to the free development of further and larger business. Naturally all such cartons of hardware ought to be very firmly packed inside of the wooden cases.

Complaint it seems is also sometimes received as to inadequate waterproofing protection of cases of hardware. To this is attributed the spots of rust which are frequently found and interfere seriously with the sal-

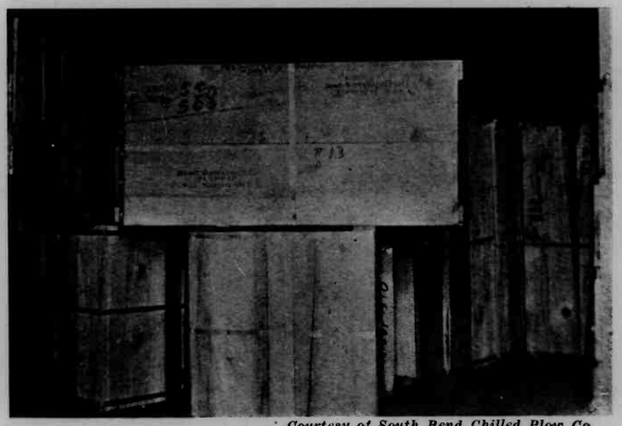
ability of the goods. Furthermore, one export merchant protests against the use of thoroughly inadequate cases in the packing of very expensive lines of hardware, and rightly believes that the more valuable the contents the greater the care which ought to be devoted to their protection.

Examples of Actual Practice.—It is worthy of note that by no means a small percentage of hardware exports is dispatched in kegs and barrels instead of in cases. This form of package is probably preferred in most instances because a keg or barrel is considerably cheaper than a suitable export packing case. Shipments in this form of container will be found discussed in a special chapter dealing with barrelled goods. In this connection one of the largest manufacturers of cast-iron cistern pumps in the United States declares that while his shipments are customarily exported in barrels, for which a charge is made only about one-half of what would be necessary if packing cases were used, yet he has one customer in Europe to whom these common cast-iron pumps are shipped entirely naked. In this particular case, the explanation is that the merchandise is transported by a direct steamship line plying between New York and the city where the customer is located, and the line in question is one of the oldest and most careful steamship companies in the world paying special attention to the handling of cargo of all sorts. The customer in this instance believes that he suffers less loss from breakage when the pumps are shipped naked than the cost even of barrels amounts to. Of course, instances like this are not to be considered as precedents. All goods, hardware and everything else, must always in the absence of special agreements with customers be shipped with the fullest and most adequate protection possible. From the experience in letters received from a great many different manufacturers of various kinds of hardware, a few extracts may be made as illustrating the practice and policy of large shippers who have been exporting their goods for a great many years.

Courtesy of South Bend Chilled Plow Co.

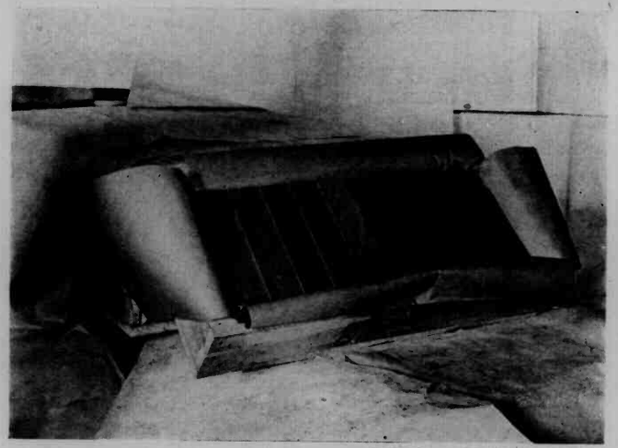
BOXING PLOW PARTS.

Shows the box before being nailed up. Prairie hay is packed around plow handles, beams, etc., to prevent scratching of paint. It is likewise used for packing between cast parts. The case is filled full of hay before nailing.



Courtesy of South Bend Chilled Plow Co.

A CARLOAD OF GOODS READY FOR SHIPMENT.



Courtesy of Goodell-Pratt Co.

PACKING OF SMALL TOOLS.

These cases are lined with specially prepared waterproof paper. Tools are packed in strong paper covered cartons.

Courtesy of Goodell-Pratt Co.

CASE OF SMALL TOOLS.

Banding for this case is of moderately heavy grade strap with turned edges. Shipping marks and case numbers are stenciled in 2" letters.

One prominent manufacturer writes: "As we manufacture over 2,000 different tools, no two of which are of the same size and shape, it is necessary for us to carry in stock a large assortment of packing cases of various sizes in order to avoid the all too common error of shipping in cases involving an excessive amount of waste space. Summing up our experience of nearly thirty years in export shipping, we believe it is necessary for exporters to study continually both qualities and styles of cases, method of packing, case lining, style of band iron used and method of applying, as well as the stenciling and handling of the packages.

"We use in every instance new cases of pine in order to save weight and get maximum strength. Our largest cases measure 37¾" x 26" x 12¾" and all our cases of the larger sizes are made from ⅞" stock in what is known by box manufacturers as Style No. 3 (with mitered cleated ends). Our smaller cases (see cuts page 410) are made in the regular manner, but when they are used for shipping hack saw blades the box ends are made of plump 2" lumber and the sides, top and bottom run from ⅞" to 1". (This case, as shown in the photograph, measures approximately 29½" x 12⅜" x 5¾" and is a very durable and satisfactory package.)

"Then we line all of our export cases with a specially prepared paper which is waterproof and keeps out both water and moisture, does not tear too easily and above all does not stain or soil pasteboard cartons with oil or smut.

"Whenever waste space is unavoidable in a case it is carefully filled with crumpled bogus paper. We never use excelsior, hay or straw, as any of the three will break up into small particles and get into the pasteboard cartons with the tools, thereby making all the cartons untidy when they are opened for the inspection of purchasers. Bogus paper is a very cheap grade of paper which will crumple up easily and make a soft but weight repelling packing.

"All items which we manufacture except small ones, such as nail sets, gimlet bits, screwdrivers, etc., are

packed one each in a strong paper covered carton. Before packing each tool is wrapped in waxed or anti-rust paper. The smaller items, nail sets, etc., are packed in similar fashion except that they are put up in lots of half dozen or one dozen to a pasteboard carton.

"Unless the cartons stand up a very little above the sides of the case, it is customary with us to place one, two or three thicknesses of corrugated paper over the entire contents in order to keep all the cartons in place and avoid the possibility of shifting, then the cover is nailed down with cement coated nails used in sufficient quantities to draw the cover tight all around the case.

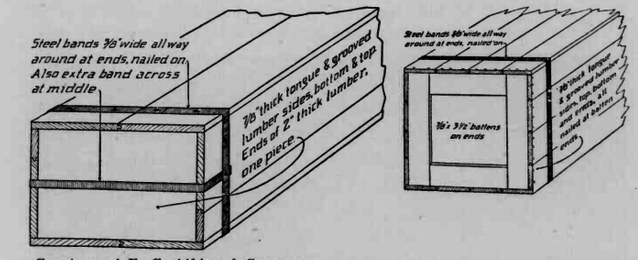
"For banding cases we use a moderately heavy grade of iron with turned edges and apply with a small hand machine which stretches bands tight before nailing.

"Stenciling shipping marks and case numbers is done with 2" letters, the forwarding agent's name and address with a smaller stencil, as will be noted in the photograph supplied. In our experience we have found that this is one of the most important points quite often overlooked when cases are stenciled for export shipment. Great care should be taken (a) to see that stencils of the proper size are used, (b) to place the markings in good position on the case, (c) to use a good grade of water repelling stenciling ink."

Other photographs supplied by another prominent manufacturer (see page 415) are self-explanatory. This manufacturer again advises the use of good quality white pine lumber in making cases, believing it light and very durable. He also urges the use of waterproof ink in marking cases; one that will not wash off or smudge.

Packing Saws.—Advices have been received from two different manufacturers of saws in regard to the methods employed by them in export packing. One manufacturer writes that "we use matched lumber 7/8" thick, line with waterproof paper, and bind with iron strapping 3/8" wide drawn very tight. The goods are firmly blocked inside the box by means of cleats, etc., and articles liable to breakage are carefully packed in excelsior. The outside ends of our cases are reënforced by cleats of 7/8" lumber, as illustrated in the attached sketches."

A second manufacturer of saws uses heavier material as will be observed from the letter which follows: "On the larger saws for mills we go over each saw with a solution to guard against rust and the saws are packed in cases lined with keep-dry paper. Cases are all strapped with either iron or wire as they are usually heavy and all are made of lumber at least 1" thick.



Courtesy of E. C. Atkins & Company.

Method of packing saws.

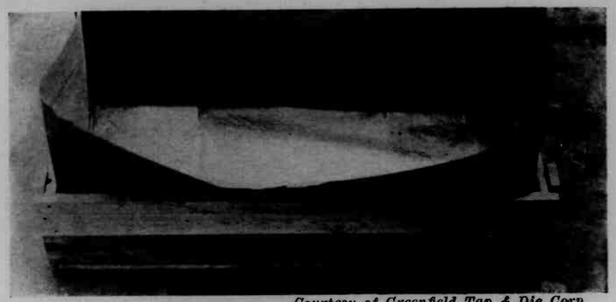
"On our hand saws and saws for the hardware dealer, where it is important that the polish on the saw should not be dulled, we use a special preparation which we have developed ourselves which lacquers the saw and prevents rust without in any way interfering with the polish.

"Our problem is to pack our goods in such a way that they will not rust and yet without interfering with the appearance of the saw, and also to pack in cases having sufficient strength to stand hard usage, as most of our products are extremely heavy for their sizes and we have found it necessary to study carefully the correct quantities of each article to be put into a case. We find it necessary to watch our packing force closely so that there will be no deterioration in the quality of material used and the extreme care necessary to ensure the arrival of goods in satisfactory condition."

Weighing Apparatus.—It is not always the concerns with the largest apparent consumer demand for their goods, nor again those manufacturing a line with "staple" characteristics that distinguish themselves pre-eminently in the field of export packing. In the course of the very extensive investigation that preceded the writing of the book, the writer was impressed many times with the work that is being done and that has been done for many years by organizations active the world over, it is true, but that do not take up the first page of the newspaper every day.

The above paragraph is particularly true in its application to the export work of one or two factories manufacturing weighing apparatus and scales. One of these factories has been in the export business for more than half a century and its activities have been characterized by a consistent effort to solve the export problem. It is interesting to note that this particular organization has proceeded along most commendable lines in determining what is and what is not adequate export packing, for factory practice has been constantly checked up with results in the foreign field. The export package, therefore, in this particular case, represents an admirable blending of the technical viewpoint of the manufacturers and the practical utilitarian opinion of the consignee and user of the apparatus.

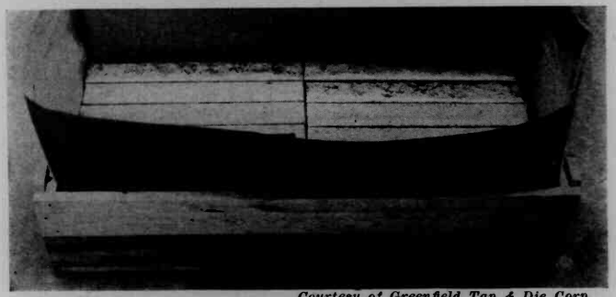
A well known company sends several photographs illustrating its method of knocking down and packing its weighing machines for export which are reproduced on pages 416 and 419. Writing in this regard the company in question remarks: "Our method of packing the scales illustrated and other varieties, is the outgrowth of our factory practice covering a good deal more than half a century, and with it have been incorporated many valuable suggestions resulting from the assistance and co-operation of numerous correspondents and customers in a large volume of business with foreign countries. There has been a very limited amount of breakage reported in any of our shipments." The captions attached to the



Courtesy of Greenfield Tap & Die Corp.

STANDARD CASE FOR SCREW PLATES.

Shows waterproof envelope always employed in this case.



Courtesy of Greenfield Tap & Die Corp.

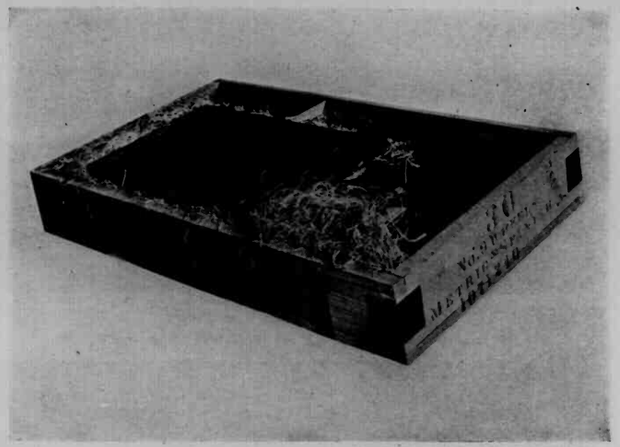
PACKING OF SCREW PLATES.

Shows method of placing screw plates in waterproof envelope.

Courtesy of Greenfield Tap & Die Corp.

CASE READY TO BE CLOSED.

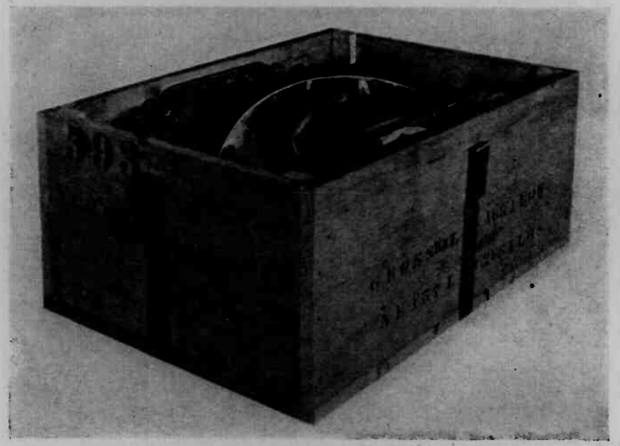
The waterproof envelope is here shown folded and ready to be sealed.



Courtesy of The Howe Scale Co.

PORTABLE PLATFORM SCALE PACKED.

Portable platform scale dismounted and placed in an uncovered case.



Courtesy of The Howe Scale Co.

PACKING OF A COUNTER SCALE.

Counter scale knocked down and packed in case.

several cuts reproduced will be found self-explanatory.

The Packing of Shotguns.—A prominent exporter states: "We use the greatest care in packing, first covering our guns with oil, after which they are wrapped in oil paper and then receive a second wrapping in strong packing paper. Following this they are packed in individual corrugated paper cartons of good weight and strength. The stock and barrels are knocked down and are so arranged in the cartons that they cannot shift about or rattle in course of transit. Finally, these individual cartons are packed in a strong and well made wooden case. For distant points like Australia we line our cases with tin but for nearby points like Cuba and Mexico we do not consider the tin lining necessary. Our cases are made of strong, heavy, matched boards and have adequate iron strapping at both ends."

The Packing of Handles.—A house doing an international business in handles writes: "Our axe, pick, sledge and similar handles are usually packed in closed cases, each containing ten dozen handles when they are destined for Europe and South American countries, but for Australia and New Zealand the cases usually containing only six dozen. Short handles, such as hammer and hatchet handles, are packed from twelve to twenty dozen to a case. All of our cases are made from sound lumber, its thickness depending on the style and quantity of handles to be packed. We always use cement coated nails and strap our cases with band iron. Occasionally we ship handles in heavy burlap bags tied with two or three ply sisal rope. We have had practically no trouble because of faulty packing and no claims for loss of goods on arrival in foreign countries."

The Packing of Forks, Hoes and Shovels.—A large manufacturer of forks, hoes and rakes states that "in packing forks, hoes and especially garden rakes some waste space cannot be avoided even though cases are made to fit the length of the tools as closely as possible. Hoes, for example, are laid in the case in the following way: A few hoes are laid with heads fitting one over an-

other, then a few more laid in the opposite direction, their heads fitting one on top of another, the ends of the second group or bundle being close up to the heads of the first. This leaves more or less vacant space between the bundles and our customers are always urged to order separate handles for repair purposes or small tools with which this space can be filled. Such smaller articles can usually be packed with the larger tools without increasing the size of the cases and thus both freight and packing charge is saved, as we pack the smaller tools without charge when they can be packed with other goods and do not necessitate a larger packing case."

A large shipper of hay forks, rakes and handles sends the following description of his practice in shipping these commodities: "Hay forks, rakes and handles are usually packed loose from ten to twenty dozen in a case weighing gross from 360 to 900 pounds. The cases are made of from ¾" to ⅞" lumber dressed on both sides, lined with oil paper and having from two to three bands of iron around each case, the number depending upon the weight of the case. We also pack handles in skeleton crates containing from ten to twelve dozen, and sometimes in bundles without crating, containing two dozen or twenty-five handles each."

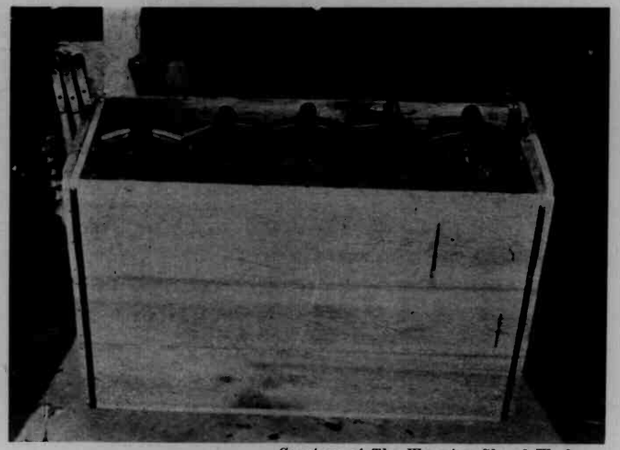
A house making a specialty of the manufacture of shovels, which has had wide experience in export work, sends two photographs, reproduced on page 420, which sufficiently explain the packing of the shovel blades. Handles are usually not packed in the same case with the blades as no vacant spaces are left in this style of packing. The handles are usually tied together and shipped separately and, in fact, the shovels themselves are sometimes bound together with wire and shipped in burlap bundles.

The Packing of Small Apparatus.—A good example of the fashion in which small apparatus may properly be shipped for export is to be observed in the reproduction of a photograph (page 423) of a case containing 50 water meters. The manufacturer describes this case as

Courtesy of The Howe Scale Co.

METHOD OF PACKING WAGON SCALE.

Photograph shows a ball bearing wagon scale held in place in uncovered case. The closed case is cleated and strapped for foreign shipment. Note the marking on covered case which shows the order and shop numbers, gross and net weights in pounds and kilos, foreign shipping marks and name of manufacturer.



Courtesy of The Wyoming Shovel Works.

CASING OF SHOVEL BLADES.

These cases contain from 12 dozen to 15 dozen blades. Handles are not packed with blades but are shipped separately.

Courtesy of The Wyoming Shovel Works.

BALING OF ROUND SHOVEL BLADES.

Shovels are burlapped, one dozen to a bundle. They are tied together with wire before burlapping and are shipped as shown. On the right is a case of blades ready for stenciling.

follows: "These are boxed in cases containing five meters each, made of ½" N.C. pine with ⅞" lumber dividing the compartments of each meter. The ten different containers are then put into the master or shipping case which is made of ⅞" N.C. pine with ⅞" x 3" battens on both ends and bottom, all securely bound with 1¼" band iron. This method of packing ten containers in a master shipping case is necessary to ensure safe ocean transportation of this class of material, and also serves to make pilfering during transit difficult."

A prominent manufacturer of ball bearings writes: "In the first place we wrap our goods in oiled paper in individual cartons. The average packing case we use is made of 1" stock, double grooved, matched boards, cleated on the ends. We use a No. 16 cement coated nail and enough of them to secure maximum resistance without damaging the boards. The inside of the case is always lined with waterproof paper and the cases are made of any suitable size so that the bearings in their individual cartons pack closely, resulting in a gross weight on an average of 380 pounds. All cases are regularly strapped with metal."

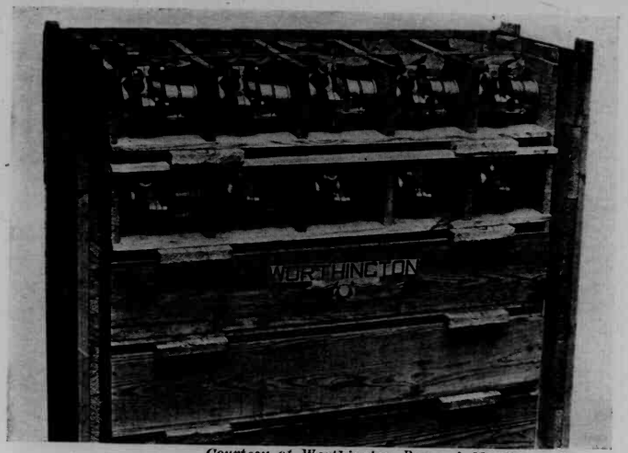
The Packing of Precision Instruments.—A manufacturer of finely adjusted electrical instruments describes his packing methods as follows: "Our method of packing, which we have found highly successful, has been developed in many years' experience in making foreign shipments. Our goods are of delicate construction and are subject to damage from shocks in transit. The material shipped is of the delicate character of watchwork and even though our problem is not so complicated as many, nevertheless it is not the simplest in the world. We have to take special precautions to see that all parts are properly cushioned with packing material to guard against shocks in transit. Of course, we have to use cases entirely, employing new boxes of ⅞" lumber with panel ends. Each piece is carefully wrapped in moisture proof tarpaulin and the case itself is lined with similar material. All seams are glued and the cases strapped with

1″ iron, the strapping extending around the ends of cases measuring up to 30″ in length, and around the battens, spaced about one foot from each end, in the case of larger boxes. We have standardized on five cases of different sizes all of the same type of construction measuring 4, 7, 11, 25 and 30 cubic feet. As our goods are light and must be adequately cushioned our largest case seldom exceeds 600 pounds gross weight. In some instances, we use metal lined cases with soldered seams, but usually this method of packing is not deemed necessary. We have few complaints on account of damage in transit, very likely because our goods are light in weight and the cases are well designed and of sufficiently heavy material."

Automobile Lighting and Starting Apparatus.—The automatic starting apparatus now so generally used as an accessory in the manufacture of automobiles is practically an American invention, and is rapidly being extended in its application to cars of European manufacture. This has developed a most promising overseas demand for the American manufacturer and in order to meet this demand good constructive work has had to be done in the export package.

The problem here is the packing of a small unit, of a fairly robust character, but at the same time one that must be sufficiently protected against the hazards of the voyage. The export packing practice has developed a container, strongly built, containing compartments which in effect give each unit a nest of its own thoroughly isolated from the rest of the shipment.

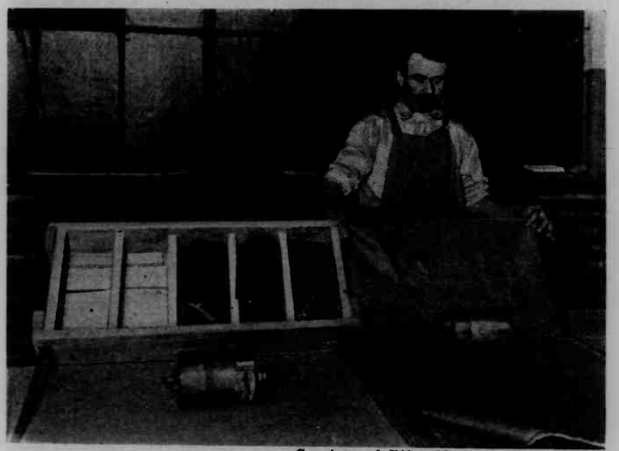
A manufacturing company doing an international business furnishes photographs (see pages 423, 424 and 427), and comments as follows: "The first principle to be noted is that when two planks are necessary in building a box they should be tongued and grooved to guard against the opening of unseasoned material. Our cases are made from ⅞″ N.C. pine reënforced at both ends with cleats. It will be observed that each machine is contained in what is practically a box of its own, owing to the divisions which have been made. Before being packed all parts



Courtesy of Worthington Pump & Machinery Corp.

PACKING OF WATER METERS.

Each meter is boxed in container made of ½″ N. C. pine, the compartments being divided by ⅞″ lumber. Ten containers at a time are then placed in shipping case, which is made of ⅞″ pine. There are ⅞″ x 3″ battens on both ends and bottom, all securely bound with 1¼″ band iron.



Courtesy of Bijur Motor Appliance Co.

PACKING OF GENERATORS.

Each machine is separately wrapped and placed in individual compartment. Blocks used to keep generators in place can be seen in the empty compartments.

INTENTIONAL SECOND EXPOSURE

1″ iron, the strapping extending around the ends of cases measuring up to 30″ in length, and around the battens, spaced about one foot from each end, in the case of larger boxes. We have standardized on five cases of different sizes all of the same type of construction measuring 4, 7, 11, 25 and 30 cubic feet. As our goods are light and must be adequately cushioned our largest case seldom exceeds 600 pounds gross weight. In some instances, we use metal lined cases with soldered seams, but usually this method of packing is not deemed necessary. We have few complaints on account of damage in transit, very likely because our goods are light in weight and the cases are well designed and of sufficiently heavy material."

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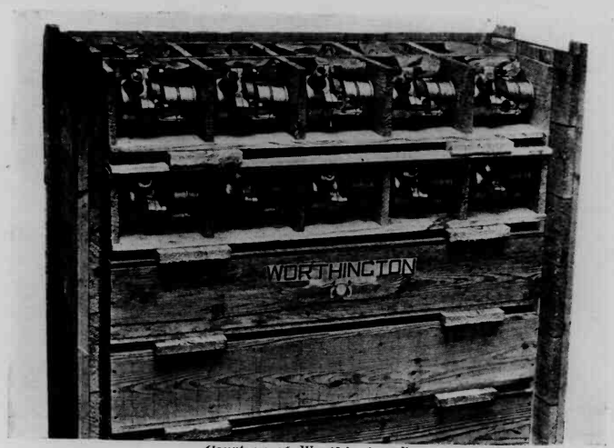
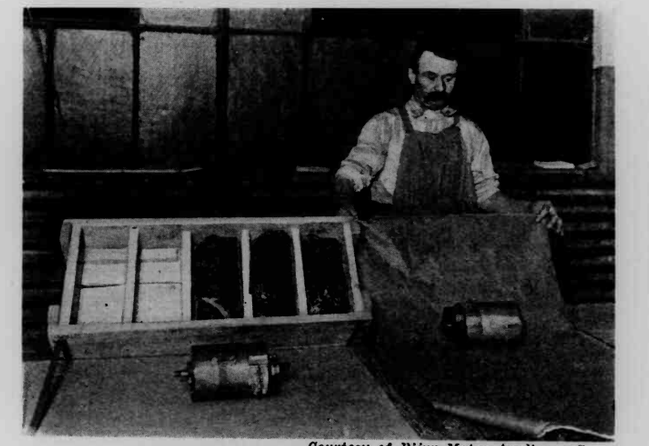


Courtesy of Worthington Pump & Machinery Corp.

PACKING OF WATER METERS.

Each meter is boxed in container made of ½″ N. C. pine, the compartments being divided by 7/8″ lumber. Ten containers at a time are then placed in shipping case, which is made of 7/8″ pine. There are 7/8″ x 3″ battens on both ends and bottom, all securely bound with 1¼″ band iron.



Courtesy of Bijur Motor Appliance Co.

PACKING OF GENERATORS.

Each machine is separately wrapped and placed in individual compartment. Blocks used to keep generators in place can be seen in the empty compartments.

Courtesy of Bijur Motor Appliance Co.

COMPLETED CASE FOR GENERATORS.

Photograph shows overlapping joint in cover and bottom, made to prevent opening caused by warping.

Courtesy of Bijur Motor Appliance Co.

PACKING OF MOTORS.

Motors are packed in waterproof paper and placed in separate compartments. Blocks are used in bottom of cases to fill out under shafting.

liable to exposure are greased and each machine is then securely packed in Safepack waterproof paper. We use ⅝" steel binding around the ends of the cases which are nailed with 8-penny cement coated nails. The photograph shows the compartments which are made to hold each machine and the blocks to support shafting or extended parts."

The Packing of Sewing Machines.—A large manufacturer of sewing machines in sending photographs of how his goods are packed (see pages 427, 428 and 435), writes: "All of our machines before being packed for export are treated with an anti-rust preparation which protects all the bright parts while the goods are in transit. Hand machines are packed individually in strong wooden boxes made to fit the machine and two, three or four are crated together with wooden cleats. Foot machines are packed flat, knocked down, in strong wooden cases lined with waterproof paper, each machine complete in its case. For some of our customers who so desire, certain models of our foot machines are packed two machines to a case, thus effecting some saving in weight and measurement. In fact, we employ various methods of packing as meeting the wishes and ideas of our agents in various foreign markets.

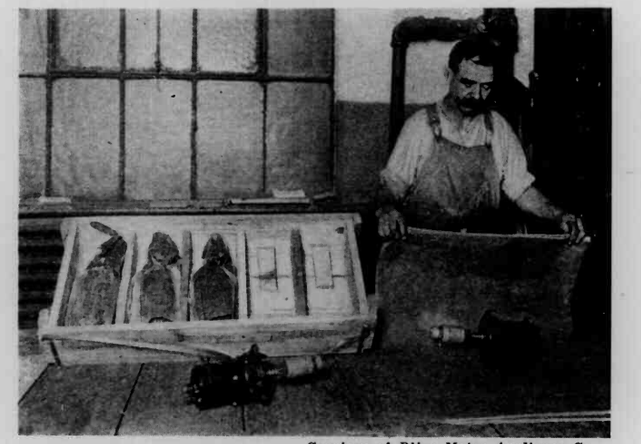
"All of our packing cases are very strong and well made and it is seldom indeed that we hear of one of them being seriously damaged while in transit. In fact, we think that this operates against us in some cases because, as occasionally happens, a package containing a sewing machine drops out of a steamer's sling when being loaded or unloaded and strikes the dock or the deck of the ship. The case itself may withstand the shock though some of the iron castings therein may possibly be broken, and in such cases the customer is sure to take the position that the damage resulted from poor packing because there is no outside evidence of damage on the case. Fortunately, however, we have little trouble of this nature, and while we assume no responsibility for the safe delivery of the goods after they have left our hands in good condition,

INTENTIONAL SECOND EXPOSURE

Courtesy of Bijur Motor Appliance Co.

COMPLETED CASE FOR GENERATORS.

Photograph shows overlapping joint in cover and bottom, made to prevent opening caused by warping.



Courtesy of Bijur Motor Appliance Co.

PACKING OF MOTORS.

Motors are packed in waterproof paper and placed in separate compartments. Blocks are used in bottom of cases to fill out under shafting.

liable to exposure are greased and each machine is then securely packed in Safepack waterproof paper. We use 5/8" steel binding around the ends of the cases which are nailed with 8-penny cement coated nails. The photograph shows the compartments which are made to hold each machine and the blocks to support shafting or extended parts."

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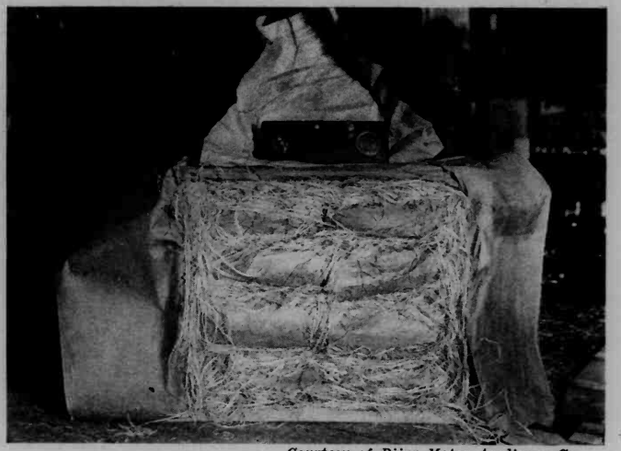
we have always maintained a liberal policy with respect to furnishing a reasonable number of parts without charge to replace damages."

In connection with export shipments of sewing machines, a prominent New York export merchant calls attention to a complaint in this respect received from a foreign customer, who states that out of a recent shipment of 24 machines four arrived in broken condition. This correspondent attributes the breakage to the fact that sufficient cushioning material was not used in protecting the castings of the frames, and strenuously complains of the loss of sales and profits because of the damaged and useless condition of the machines when they were received. He is of the opinion that all iron castings ought to be nested in all-around packing of excelsior or some similar material, at least 1″ and preferably 2″ in thickness. In this same connection attention may be directed to the instructions issued by the General Engineer Depot of the United States Army, which have been referred to in the chapter devoted to the packing of machinery, in the course of which it is to be remarked that these instructions provide that all castings forming parts of machines must be thus cushioned when they approach closely to the walls of the exterior case.

Electric Fans and Motors.—A large manufacturer writes in regard to his packing that 8-inch fan motors are usually packed 18 in a case, the blades, guards and guard supports 36 sets in a case, which is always securely strap ironed. Nine-inch motors are usually packed 12 in a case, the blades, guards and guard supports 24 sets in a case, while 12 and 16-inch fan motors are usually packed six in a case and the blades, guards and guard supports 24 sets in a case.

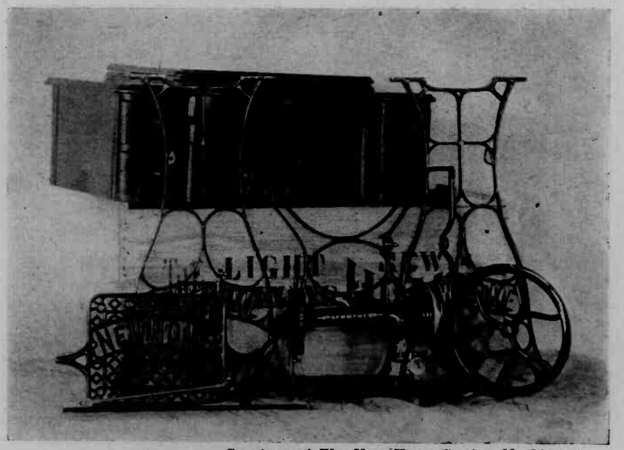
Twelve and sixteen-inch ventilating fans are packed singly, each complete fan in a strap ironed box, three of these individual boxes being crated securely together. In the packing of ceiling fans the motors are packed individually in iron strapped cases, the ceiling canopy, hook and insulated hanger being packed in the box with the



Courtesy of Bijur Motor Appliance Co.

COMPLETE CASE OF SWITCH PANELS.

Switch panels comprising fuses, ammeter and switch individually wrapped and firmly held by means of excelsior.



Courtesy of The New Home Sewing Machine Co.

DISASSEMBLING OF SEWING MACHINE.

Photograph shows sewing machine disassembled ready to be placed in the case.

INTENTIONAL SECOND EXPOSURE

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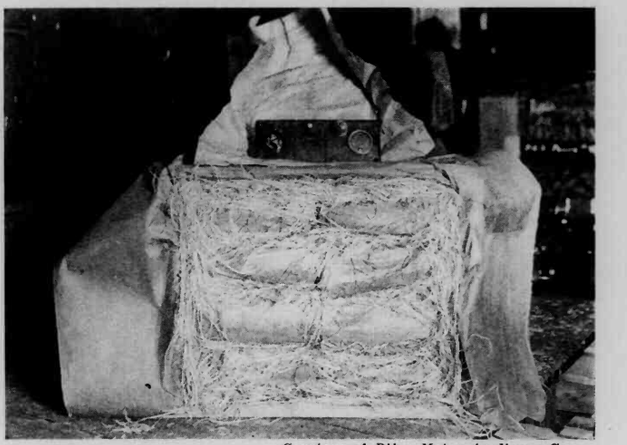

Courtesy of Bijur Motor Appliance Co.

COMPLETE CASE OF SWITCH PANELS.

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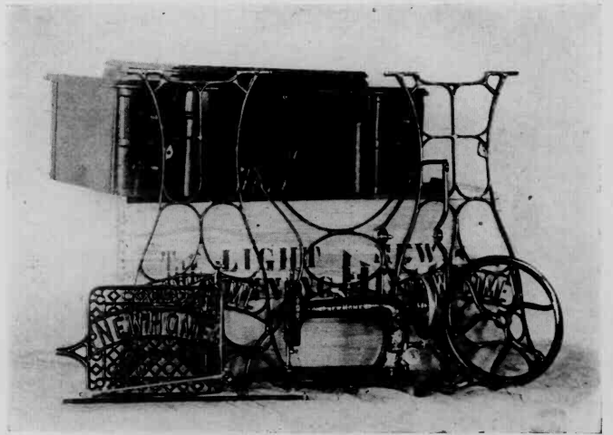

Courtesy of The New Home Sewing Machine Co.

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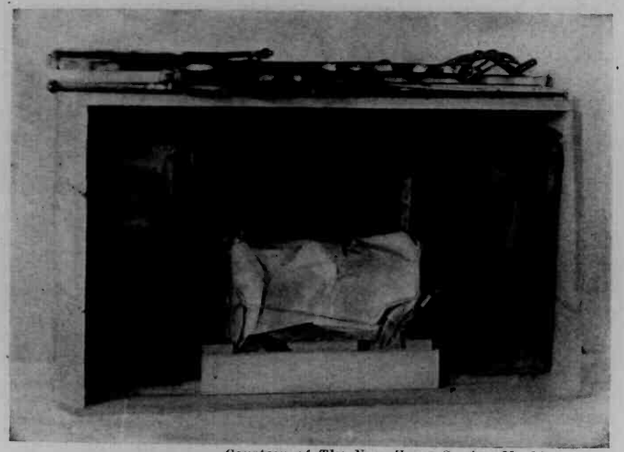
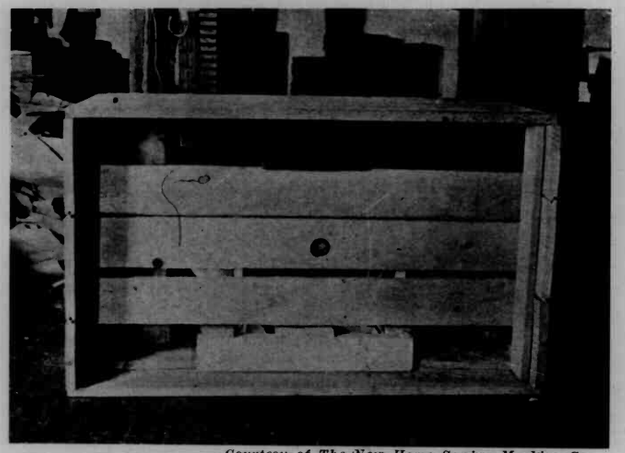
Photograph shows sewing machine disassembled ready to be placed in the case.



Courtesy of The New Home Sewing Machine Co.

CASING OF SEWING MACHINE.

Woodwork and head placed in case. Head is wrapped and securely cleated to bottom of case.



Courtesy of The New Home Sewing Machine Co.

METHOD OF PACKING SEWING MACHINE.

Case containing sewing machine ready for treadle castings. Note method of holding parts in place.

fan motor, three of these boxes being crated securely together. The blades are packed four sets in a box, six of which are crated together. The hanger rods (if required) are packed separately.

Small motors are not packed individually but several are packed in a box according to the number of motors on the order and their sizes. Motors of from ½ h.p. upwards are usually boxed entirely and bolted on skids through the bottom of the box. They are braced from the top to hold them securely and the cases are lined with tar paper and strapped with band iron.

Packing Bolts, Nuts and Rivets.—A large New York exporter doing business with the Dutch East Indies complains rather bitterly of the light barrels or boxes in which bolts, nuts and rivets are usually shipped, stating that he has not yet made a single shipment of these commodities which arrived safely at port of destination. It has been his experience that a large percentage of the cases, boxes or barrels arrive broken with merchandise partly lost. Much stronger cases must be used and this exporter advocates extra heavy and strong boxes thoroughly well strapped and weighing gross not to exceed 200 pounds.

The Packing of Chains.—A manufacturer writes: "We manufacture chains of round material with welded links and in all sizes up to and including 2½" stud link cable chain. Sizes larger than 1" are shipped loose, not packed in any way. Small sizes of chain are shipped in heavy oil barrels well coopered and in some instances are ordered packed in wooden cases, but this involves an additional charge because of the heavy expense for this style of packing."

Another manufacturer of chains states: "Some of our chains are packed in bags, some in crates, some loose and some simply wrapped in paper. We are very careful to line all cases and barrels with waterproof paper and usually sprinkle over the chains a non-hydrating product in order to prevent rust during transit. Small sizes of cases and barrels are used in shipping to the West Coast

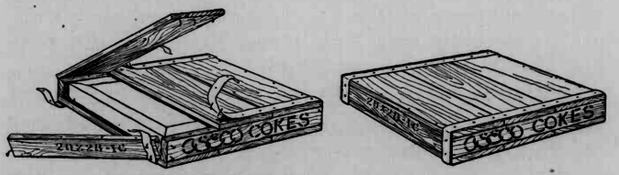
of South America, but in principle we have to follow the instructions of the importers in different parts of the world which vary with almost every country."

The Packing of Tin Plate.—No little discussion has arisen regarding the proper packing of tin plate for export since the American industry in this line assumed such large proportions as the result of the great war. The American purchasing agent for large meat packing establishments in South America states in a letter that so many complaints were received, both from merchants as well as from packing houses, to the effect that tin plate had been delivered in very poor condition, in some cases accompanied by very disagreeable claims, that he has persuaded his clients to order all tin plate shipped in tin lined cases. He writes that "the thin material used in the absence of tin linings will not suffice to convey any case of tin plate to South America with any degree of assurance that it will be delivered in good condition."

An important New York exporter of steel products writes that when tin plate is packed in a box designed for domestic shipment and entirely satisfactory for that purpose, it has been found in experience that such a package is entirely unsatisfactory for export even when it is tin lined and strongly strapped. Foreign buyers, this exporter urges, must be persuaded to pay for the expense of providing extra strong wooden cases built to stand transhipment, if not for the additional charge of adequate tin lining.

A large manufacturer of tin plate states in a letter: "About 75 per cent of tin plate shipped for export moves out in wooden boxes with iron straps around the ends of the boxes. We have endeavored for a long time to standardize tin plate packing by having all consumers take their tin plate packed in tin lined cases, hermetically sealed, and with the wooden box iron strapped around the edges, but this additional cost of packing amounts to an average of about $1 per unit and is looked on as an excessive cost added to the merchandise; yet the claims arising from the handling of the material, due to damaged cases and damaged tin plate, almost equals this additional cost without calculating the annoyance and injury that is done the plate in general.

"One point that has done more than anything else to discourage the adopting of the tin lined case for our packing, has been the excessive high cost of our product for the last five or six years. Perhaps we will be more successful as we get down to a more reasonable price for this commodity which would not only reduce the cost of this special packing, but would not be so serious a factor in the cost of material."



Courtesy of American Steel Export Co.

Method of packing tin plate.

There seems to be some difference of opinion among manufacturers and exporters as to the proper additional charge for lining shipping cases with tin. A prominent house sends the drawing shown above and states in a letter: "The usual method of packing is in light wooden boxes, containing 56, 112 or 224 sheets, iron strapped all the way round full length of the box. If the plates are likely to come in contact with water or excessive dampness they should be packed in a tightly soldered metal envelope inside the wooden box. When packed in this manner they are protected against moisture and may safely be stored. There is an additional charge for these tin lined cases, based on the actual cost of material and labor. This charge may be estimated at 25 cents per base box of 14″ x 20″—112 sheets, which would be the minimum charge."

The Packing of Wire.—An experienced shipper states that the different markets require different styles of

packing of wire, which is sometimes shipped in bundles protected with paper and burlaping or sometimes in burlaping alone, especially when it is a shipment of galvanized wire. All wire from No. 25 to 30 gauge should be packed in specified weight bundles and wrapped in paper in addition to burlap, while wire finer than No. 30 gauge should be packed in barrels. The best ways of thus packing have been explained in the chapter devoted to the packing of barreled goods.

The Packing of Wire Nails.—Wire nails are usually exported in strong kegs, the heads of which are reenforced top and bottom with steel cleats. Linings of heavy waterproof tarred paper are employed by one large shipper to protect the nails from damage from moisture. Further details regarding shipments in kegs, barrels, etc., are included in the special chapter devoted to barreled goods.

CHAPTER XVI

EXPORT PACKING OF GLASS, GLASSWARE AND EXCEPTIONALLY FRAGILE GOODS

NOTHING surely can be more obvious than that the packing of glass, glassware, commodities shipped in containers of glass, and all similarly fragile merchandise, to undergo satisfactorily the many and serious hazards of overseas shipment, involves problems calling for not alone the highest skill, but a thoroughgoing scientific study of the packer's art, and all conditions, possibilities and results. Very likely it may be true that it is a physical impossibilty so to pack glass, and other exceedingly fragile merchandise, that breakage will be absolutely prevented. At the same time, it is plainly so much to the advantage of the future trade of manufacturers and shippers of such merchandise that their products arrive in the hands of their customers with a minimum of damage, that this problem should be regarded as peculiarly deserving of attention. Most importers in other countries of the world are always willing to pay somewhat better prices for goods of this description, when they can be assured that the contents of the cases, when received, will be unbroken, or involve comparatively little loss. Manufacturers must remember that breakage not only causes extra expense to customers, but deprives them of goods which may be urgently needed for sale, on whose safe arrival the importer may have been counting. Some manufacturers offer to make good any loss from breakage due to careless packing, but the mere refunding of the cost of broken goods, or of supplying new goods in place of those damaged, is by no means sufficient, for it is to be remembered that the consignee has paid ocean freights, import duties,

landing and many other charges on the goods which have arrived broken and useless.

Unfortunately it is doubtless true that the United State has not, in recent years, achieved a wholly enviable reputation for packing glass and glassware. The manager of the Chilean office of a large New York export house states, that the average breakage of American glassware shipped to South America ranges from 20 per cent to 35 per cent, caused absolutely by poor packing, whereas the average breakage of European glassware, because of the excellence of that packing, runs only from 2 per cent up to 5 per cent. Complaints of this description were very notable soon after the outbreak of the great war, when the stoppage of European shipments of window glass and plate glass, and in general all kinds of glassware, brought export opportunities to the door of American manufacturers of such goods which they had never enjoyed before. Complaints of breakages amounting to as much as 50 per cent and 60 per cent were at first by no means uncommon. Fortunately we seem to have learned rapidly how to improve our packing of such materials, for statements have recently been made by South American importers that the breakage on American goods has of late been only about 6 per cent, as an average. However, even this percentage is excessive, as will be seen from a comparison of the percentage of European goods which arrive in similar ports in better export packages. In some markets the English packing is regarded as the best, and there seem to have been several different kinds of packing employed by English manufacturers, some of them winding glass in straw and securely fastening it in the case, and others employing cases with wooden partitions. On the other hand, Belgian manufacturers are commended by many importers, and manufacturers of that country seem to have set the example, which is now being most generally followed by American manufacturers, of employing the "floated" package—that is to say, of packing the goods themselves in separate cases and sometimes in cartons which are

Courtesy of The New Home Sewing Machine Co.

CASE CONTAINING SEWING MACHINE.

Photograph shows all parts of sewing machine in case ready for cover.

Courtesy of Hazel-Atlas Glass Co.

PACKING OF JARS AND TUMBLERS.

Case shown at left contains small opal jars and is lined with oil paper to protect metal caps of jars. Jars are packed three to a package wrapped in heavy paper and are further protected by refuse prairie grass. At right is shown case containing nested tumblers individually wrapped in paper and packed flat. Note protective lining of prairie grass.

INTENTIONAL SECOND EXPOSURE

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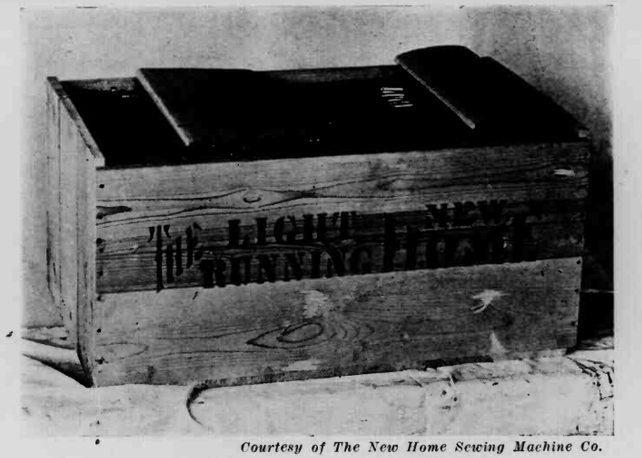
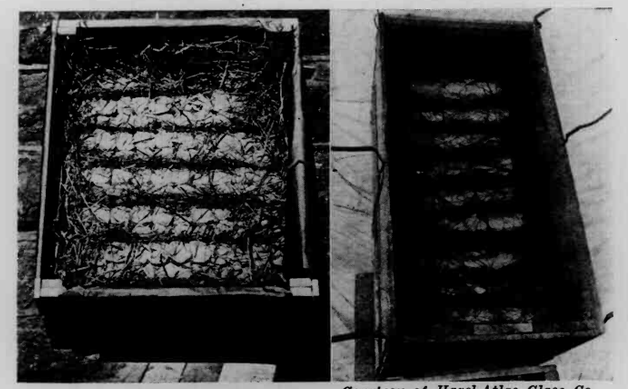


Courtesy of The New Home Sewing Machine Co.

CASE CONTAINING SEWING MACHINE.

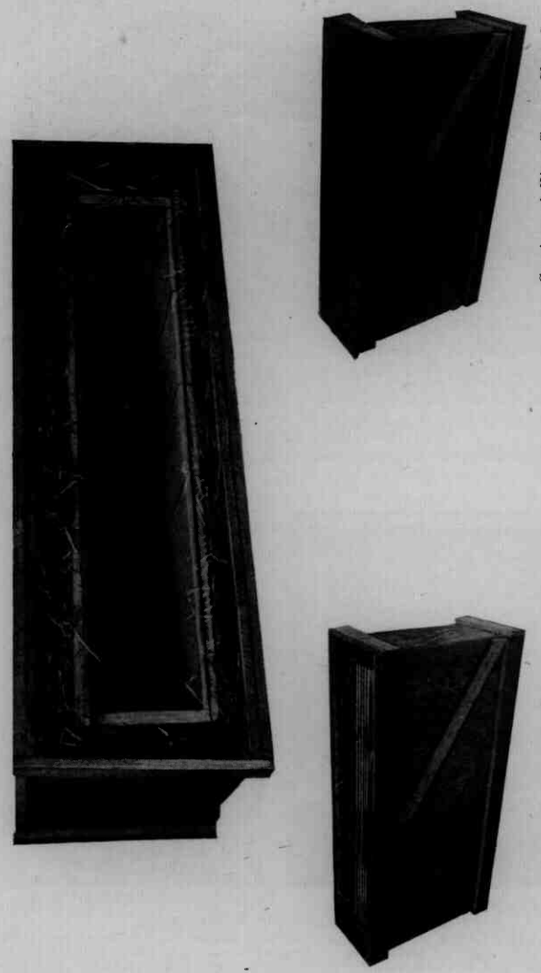
Photograph shows all parts of sewing machine in case ready for cover.



Courtesy of Hazel-Atlas Glass Co.

PACKING OF JARS AND TUMBLERS.

Case shown at left contains small opal jars and is lined with oil paper to protect metal caps of jars. Jars are packed three to a package wrapped in heavy paper and are further protected by refuse prairie grass. At right is shown case containing nested tumblers individually wrapped in paper and packed flat. Note protective lining of prairie grass.



PACKING OF SHEET GLASS. *Courtesy of Hires Turner Glass Co.*

These photographs illustrate the use of single and double cases. Paper is placed between plates of glass and space between inner and outer cases is filled with hay or straw tightly packed. For full description of these packages see text.

floated on top and bottom cushions and between walls of excelsior, or other similar material. The Japanese are said to have a way of packing glassware which makes a compact and fairly safe package, each article being wrapped in grass or straw, and nested whenever possible.

It must always be remembered, in the packing of highly fragile commodities of any description, that shipping cases containing such goods will be subject to precisely the identical treatment to which cases of hardware or any other commodities are subject, in loading aboard steamers, unloading into lighters, rough handling on shore, etc. The warning signal "Glass—Handle With are," no matter how big the letters with which it is stenciled on the outside of a case, cannot be relied upon to influence the heart or the hand of the longshoreman in the United States or in any other country, even if he understands the English language, which in our export markets is rarely the case. Shipments of glass or similarly fragile goods are likely to have dropped upon them at any time a ton or two of steel rails, lard, or something else, or just as likely to fall out of ships' slings onto decks or quays as are cases of boots and shoes. Shipping cases must be so constructed, and the contents so protected, that our customers in other countries will be fully satisfied with their trade with us, and contrast our methods favorably with those of competing manufacturers in other countries.

Export Packing of Sheet Glass.—Before the war, English and Belgian window and plate glass virtually controlled the markets of the world, and considerable Belgian glass was imported by the United States. The English packing was commended by importers in some markets for its ample cases of heavy lumber, usually from 12 to 16 plates being put into a case, tissue paper separating the plates, and preventing scratching. A layer of wood shavings was usually employed in the bottom of the case, and a smaller layer placed on top, and shavings stuffed tightly all around. From 8 to 10 of these smaller cases were then packed in the large outside container,

tightly stuffed all around with straw, and finally strongly banded with iron strapping. Breakage resulting when this style of packing was employed is described as being insignificant. Belgian manufacturers packed their sheet glass tightly in a light case similar to that usually employed by American manufacturers in their domestic trade. This was enclosed in a strong, heavy outside case, of sufficient size that ample cushioning was provided on all sides of the inside case, which contained the glass. Thus any blows received were distributed in such a manner that the glass itself was practically uninjured. Some importers have recommended that instead of having the walls of the inside case parallel with those of the outer case, it should lie diagonally, with two corners touching the outside case, but the two opposite corners thoroughly cushioned. This fashion of packing is thought by some, when the cushions are ample and properly made, to reduce still further the risk of damage from shocks.

Through the courtesy of a large American manufacturer, there are reproduced on page 436 three cuts which illustrate clearly the different packages which this manufacturer has adopted. The company states that the lumber employed in the packing cases is usually North Carolina pine, but occasionally hemlock and chestnut, from ¾″ to 1″ for the sides, and from 1″ to 1¼″ for the ends, top and bottom, when single cases are employed. Double export cases are the same, so far as the outer case is concerned, but lighter lumber is employed for the inner case, usually ⅝″ thick for the sides, ¾″ to 1″ for the ends and bottom, and ⅝″ for the top. Hay or straw is used by this manufacturer in packing plate glass and window glass, and very often excelsior is used in the packing of mirrors. All glass is embedded in heavy packing ranging from 1″ to 3″ in thickness, around bottom, top, ends and sides. Paper placed between the plates prevents the immediate contact of the glass, and is used in packing both mirrors and plate glass. In the case of mirrors, there is also always an envelope of waterproof paper, and when mirrors are shipped to

tropical countries, cases are tin-lined, as a final precaution against moisture. Cases are well battened, and encircled with substantial iron strapping.

Further and more detailed particulars are supplied as follows: window glass is packed in cases containing from 50 to 100 square feet each. Gross weights of individual cases vary somewhat, but average about as follows:

50′ cases —	single strength	85	pounds per case
	double strength	110	" " "
100′ cases —	single strength	150	" " "
	double strength	200	" " "

Cases containing 60′, 70′, 80′ and 90′ vary proportionately in gross weight. Hay or straw is used as a bedding. Thickness of packing depends on the size of the glass and case, and varies from ¾″ to 1½″ on all sides. Packing cases for export, as a rule, are determined by allowing ¼″ for each three lights, single, or 12 to the inch; and ¼″ for each two lights, of double, or 8 to the inch—allowing ¾″ packing space on each side, or 1½″ to the case. No head is cut any less than 2¾″, which would mean that on the larger sizes there might be a little more than 1½″ packing space. The cases are 2″ higher than width of the glass, and 6″ longer than the length. However, this does not hold good on the smaller sizes. On the 14″, 15″, 16″ and 18″ widths the case is 1″ higher, but on the 20″ and above, 2″ higher. Solid lumber, usually ½″ thick, is employed for the sides, and ⅝″ to ¾″ for the top, bottom and ends. Cases measuring over 70 united inches have battens at the top, bottom and sides, and frequently on the ends. In packing cases of 100 square feet in 40″ bracket, or less, there are two compartments in the case, separated by a wood partition.

When figuring on export orders, it is necessary first to know what the gross weight is to be, and then to determine the proper number of feet to be packed in each case. For instance, the following table should be considered, in which 750 pounds has been taken as the gross weight of the case, and the sizes worked out accordingly.

In making single solid cases, all the lumber should be very sound, and of 1″ thickness. It should be in the rough, with the exception of the lid, one side of which should be planed for stenciling. There should be a 2″ cushion of straw on the bottom, top and both ends, and on the sides there should be 1″ of straw between the glass and the box.

INFORMATION FOR FIGURING SIZE OF BOXES FOR EXPORT SHIPMENTS
SINGLE SOLID CASES

Gross Weight of Case	Size of Glass	Lts. Per Box	Size Each 14 Lts.			Inside Dimensions			Outside Dimensions		
			Width	Height	Length	Width	Height	Length	Width	Height	Length
750#	24″x60″	14	5″	24″	60″	7″	28″	64″	11″	30″	68″
					DOUBLE SOLID CASES						
						Outside Case			Outside Case		
750#	24″x60″	10	4″	24″	60″	13″	35″	70″	17″	37″	74″
						Inside Case			Inside Case		
						6″	28″	64″	9″	30″	66″

For the double solid cases the same size glass and same gross weight have been used, and in arriving at figures for size of boxes the procedure shown above and in accordance with table mentioned is followed. The outside box should be made of 1″ sound, rough lumber, and the ends, bottom and lid of the inside box should be made of 1″ rough lumber, and the sides of ½″ rough lumber. Rails and braces should be of 1″ rough lumber. In packing a double, solid box for export, a 2″ cushion of straw is first placed in the bottom of the outside box. The inside box is then placed inside of it, and straw is packed all around the ends and sides, which makes a 2″ cushion of straw between the inside and the outside box. A 2″ cushion of straw is placed in the bottom of the inside box, and the glass then placed in this box. Ten lights would measure about 3¼″ in width (which may be called 4″), 24″ high and 60″ long. Straw is then packed all around the glass and on the top of the glass, which makes a 2″ cushion of straw on the bottom, ends and top, and a 1″ cushion on the sides between the glass and the box. The lid is then put on the inside box. Another cushion of straw 2″ thick is placed on the top of the lid of the in-

Courtesy of Hazel-Atlas Glass Co.

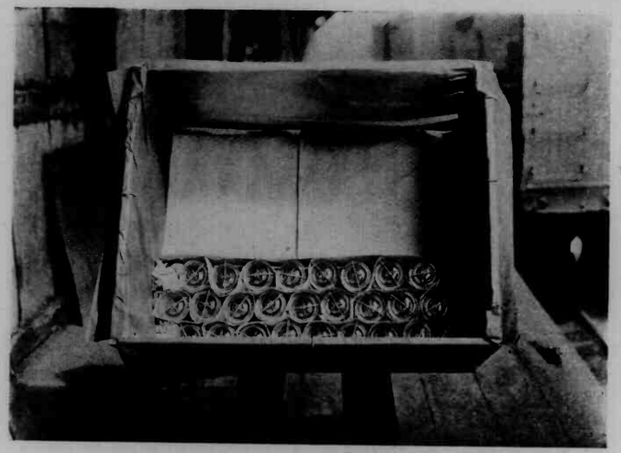
PACKING OF TUMBLERS.

Shows ware before packing. Note that tumblers are each wrapped in paper. Those at the left are to be packed nested and flat, while those at the right are to be packed singly and up and down.

Courtesy of Hazel-Atlas Glass Co.

METHOD OF PACKING SMALL BOTTLES.

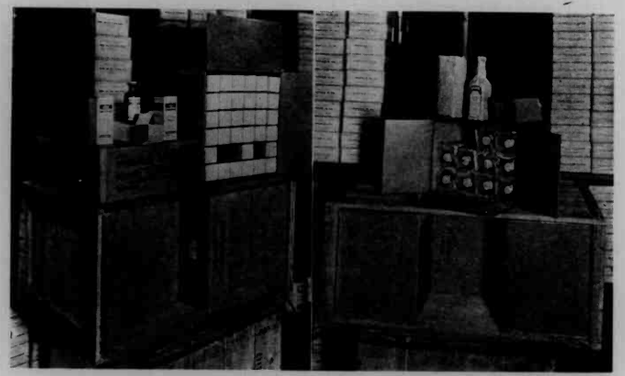
Case is divided by partition and lined with felt paper. Felt paper is placed between each row and each layer of bottles.



Courtesy of Hazel-Atlas Glass Co.

METHOD OF PACKING FRUIT JARS.

Case is lined with waterproof paper to protect metal parts of jars. Felt paper is wound around each jar and is placed between each layer of jars.



Courtesy of Parke, Davis & Co.

PACKING OF PHARMACEUTICAL PRODUCTS.

Illustration at left shows method of packing peroxide in individual cartons, 3 dozen being put in heavy carton packer. Six large cartons fill case. Illustration at right shows packing of long-necked, square bottles in cases of 6 dozen each. Each bottle is provided with straw sleeve, and 1 dozen bottles are packed to a carton.

side box, the lid of the outside box is nailed on, and one side of the lid of the outside box is planed for stenciling.

It is customary to pack polished plate glass and mirrors in cases from 100 to 500 or 600 square feet each, depending on destination. Both single and double casing is used for mirrors, but rarely for plate glass. The gross weight of case packed varies according to the quantity of glass in the case. When packed in single cases, the gross weight is estimated at from 4½ to 5½ pounds per square foot of glass contained in the case. When packed in double cases, the gross weight is increased from 50 to 75 per cent.

Packing of Bottles, Table Glassware, Etc.—A prominent American manufacturer of milk bottles states that he packs his products in crates containing 6 dozen quarts, 6 dozen pints and 12 dozen half-pints, similar to the crates employed for domestic shipment, except heavier and stronger. Bottles are protected each from its neighbor by a padding of felt paper, usually the ordinary carpet paper being employed.

A large manufacturer and exporter of bottles and fancy glassware submits a number of excellent photographs, reproduced on pages 435, 441, 442, and in writing regarding the company's packing, states: "When we first started to ship to the export trade our packing was undoubtedly very crude, but we have not at any time lost sight of the advantage of properly protecting our ware, with the result that we have been able to standardize our packages in such a way as to give maximum protection to the contents. As we ship to practically every port in the world in considerable quantities, with a rare claim for breakage, we have come to the conclusion that our packages are sufficient protection to the ware and will carry without damage to the contents, unless the shipment is roughly handled en route, in which case, on account of the brittle nature of the product, damage of course can be expected. We have made test shipments to various parts of the world, having the shipments returned to the factory for inspection by our factory people, and all of

the test shipments made were returned to the factory with practically no breakage. In addition to test shipments which we have made from time to time, we have checked up with our clients the condition of the shipments when delivered, and the invariable report is that the cases were in good shape and the contents without breakage sufficient to justify a complaint. While we feel that our packages at the present time are substantial in every way, and fully protect the ware, yet we are not altogether satisfied, and we are constantly experimenting with new packages, and it is our hope that some time in the future we will be able to develop a package to our own satisfaction and the satisfaction of our trade, which will be ideal for a product such as ours. As we have a reputation to maintain, not only at home, but in the foreign fields, this matter is given close attention at all times, and the supervision at the factory is very close, so you will understand that we are in the foreign market to stay and that it will be our endeavor at all times to maintain the standards already set, and increase the efficiency of our packages wherever possible.

"We have tried various materials, such as excelsior, wheat and oat straw, but we have found, in connection with these articles, that if the ware is packed and allowed to remain in stock for a period of two to three months, the packing dries out to such an extent that it becomes very brittle, and when shipped to the export market the natural action in the shifting of the cargo causes the packing materials to pulverize and fall to the bottom of the case, allowing very little protection for the ware. This has reference to our tumblers, opal jars and small bottle shipments, and to offset this we decided that each tumbler should be wrapped separately in heavy paper, the opal jars, where packed in bulk, to be wrapped three to a package, and that an entirely different protection was required for the small flint bottles. In addition to wrapping each tumbler separately and nesting where possible, the rows are supported, as the photographs will show, by an insulation of refuse grass which is secured from

the carpet factories in the Northwest, and which is very tough and will not break up as is the case with the straw. The rows of opal jars as packed in the case are also insulated by the insertion of the same grade of material, which, on account of the thickness of this insulation, fully protects the ware under normal transportation conditions.

"The packing of the small bottles for inks, pomades, and shoe polishes was very difficult, and we finally decided to test our packages, protecting the ware with indented felt paper strips cut to the size of the articles, which strip is entwined around the bottle and protects it on all sides. The bottles are packed in tiers, and each tier is separated one from the other by a pad of indented felt paper, and the cases lined throughout with the same material.

"The packing of our jars for jams and preserves was also very difficult, and it was found that the use of hay or straw would not fully protect the ware, so the felt paper packing used identically the same way as the small bottle packages was decided on, and we have for the past three years been using this type of package. As the photographs will show, all cases where a cap is fitted to the jar or bottle are lined throughout with a waterproof paper, so as to prevent moisture getting to the caps and causing corrosion.

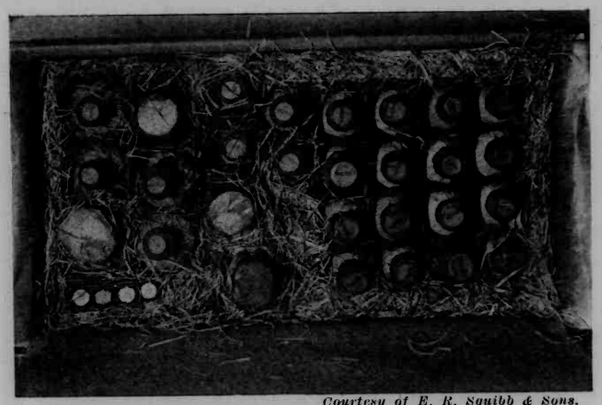
"You realize that it is practically impossible to procure lumber at this time to meet certain standards to which we endeavor to adhere, and at times we are forced to use an inferior grade. Our specifications provide for hardwood lumber, and we endeavor to secure the best grade of this type that the market can produce. Our cases are made up in 7/8" lumber, heavily reënforced at the ends to make the case as rigid as possible, so as to withstand hard knocks. The factories all use cement-coated nails, and in addition to the nailing of the cases they are all iron-bound, as a further protection."

A New York export house, doing business with South Africa, draws attention in a letter to the possible effect

on a manufacturer's export business of the indifference or ignorance displayed in the attention given to the question of packing glassware for export. A South African customer recently described to this merchant his experience in importing American lamp chimneys. One manufacturer simply packed the chimneys in straw or excelsior, and the loss, through breakage, on every shipment was considerable. Another American house was found which packs each chimney in a carton, and ships, carefully packed, in cases of 6 dozen each, with the result that there is scarcely a chimney broken in any shipment which has been received. It is not difficult to judge where this importer's future orders will be placed. South African importers have also complained, according to this merchant, of the American packing of fruit jars, there still being considerable loss from breakage in shipments received from some manufacturers.

Another New York exporter, doing business with the northern coast of South America, where harbor and landing conditions are not of the best, suggests that barrels or cases containing glassware should not exceed from 125 to 150 pounds each, in order to facilitate handling on arrival and in inland transportation, and while the outside containers must be strong, yet in these countries they must be as light as possible to avoid payment of excessive duties, and so made that they can be readily opened for examination at the custom houses without entailing unnecessary destruction of the cases. This exporter believes that excelsior is the best material for stuffing or interior packing because of its lightness and elasticity, claiming that where cheap hay is used it often mats together and allows motion, with consequent breakage of the contents. It is believed that bottles, if possible, should be wrapped in porous paper.

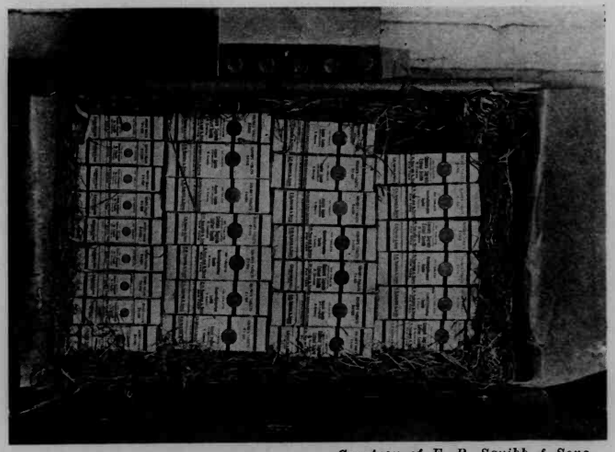
Another American export house writes that there has been a distinct improvement in the American packing of glassware, but that there still continues a considerable amount of breakage, especially when glassware is merely packed in hay or straw in casks or barrels. This ex-



Courtesy of E. R. Squibb & Sons.

PACKING OF ONE-POUND GLASS BOTTLES.

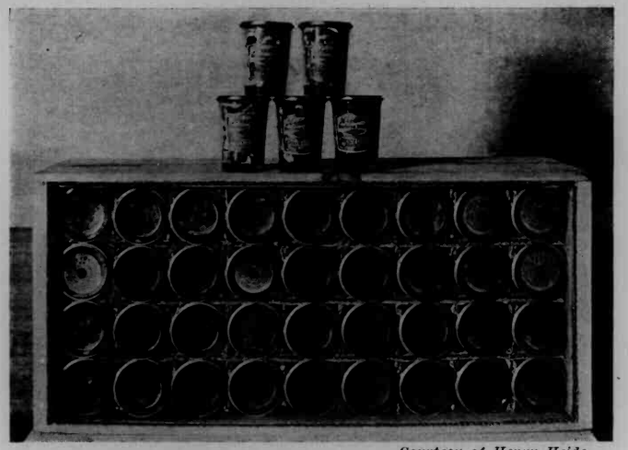
Bottles are packed in corrugated partitions with a 2" outside layer of excelsior and an additional layer of excelsior on top. Case is lined with waterproof paper.



Courtesy of E. R. Squibb & Sons.

PACKING OF BOTTLES CONTAINING TABLETS.

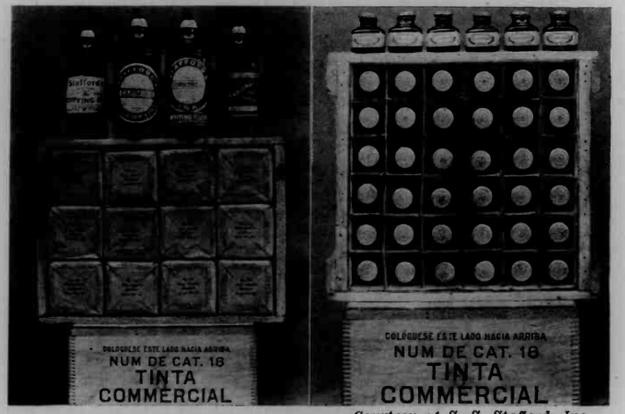
Case contains cartons of medicinal tablets in bottles. The cartons on top of the case show corrugated packing between bottles. Extra protection is afforded by a 2" layer of excelsior.



Courtesy of Henry Heide.

METHOD OF PACKING HARD CANDIES.

Glass jars containing hard candies packed in two layers of 36 each. Mats of corrugated paper are laid on bottom and around sides of case, between layers, and on top of case. Corrugated partitions are used between jars.



Courtesy of S. S. Stafford, Inc.

METHOD OF PACKING WRITING INKS.

Case at left contains one dozen quart bottles enclosed in cartons of corrugated board and strong brown paper. Corrugated board mats line sides, top and bottom. Case at right contains four layers of 36 small bottles each separated by corrugated board. Top, bottom, and sides of case are likewise lined with this material.

porter advocates the use of corrugated paper as an envelope for bottles, and thinks that much thicker paper ought to be employed than is usually the case, and that the smaller and particularly the more expensive goods should be carefully done up in packages, with the numbers and contents of each written on them, to facilitate identification and checking, as well as assisting in preventing damage.

Packing of Cut Glass and Crockery.—Some time before the war a German concern engaged in importing American cut glass complained rather bitterly that although the outside packages, when received, appeared to be intact, yet there was a large amount of breakage in every shipment, which it attributed to the fact that the straw employed for the packing of these goods was not sufficient in amount, and was not spaced accurately all around each article and throughout the whole extent of the package. The casks and barrels seemed to be sufficiently strong, but not enough thought had been given to the effects on the interior packing of the long voyage and the unusual treatment which shipping cases have to undergo when forwarded by rail, lighter, steamer, river boat, etc.

A prominent exporter of cut glass writes that his products are always wrapped individually in paper, each wrapper bearing a number and description, to facilitate checking of invoices at the other end. This exporter always ships cut glass in barrels, believing there is less danger of breakage when forwarded in barrels rather than in cases. This matter will be found referred to in the special chapter devoted to shipments of barreled goods. The barrels employed are lined with waterproof paper, and the greatest care is exercised in separately padding each individual item, while packing all snugly and tightly.

In the packing of chinaware either cases or barrels are employed—barrels usually, unless there are a number of square or cartoned packages in the assortment. The different pieces of chinaware are separated by layers of

excelsior and placed on top of a bed of excelsior in the bottom of the barrel or case, and a similar layer finishes the top packing. If the china has gilt decoration it is first wrapped in paper, in order that the decoration may not be scratched. English shippers are said to be very particular in the protection given to all gold decorations, usually employing a fine grade of tissue paper. They usually employ straw instead of excelsior, and more often cases than barrels, probably because barrels are not quite so common or cheap as they are in this country.

Packing of Products in Glass Containers.—Under this heading there may be considered a very large class of American products of wide variety, ranging from perfumery and toilet preparations to medicines, drugs, ink, confectionery, jams, pickles and other foodstuffs. All commodities packed in glass containers should have even more attention devoted to their proper protection for overseas shipment than would naturally be devoted to the same bottles or other containers if shipped empty, for the reason that the additional weight of the filled bottles or jars introduces a further element of risk, and furthermore, these products are usually intended for counter or shelf display purposes. and hence they must arrive with attractive exteriors as well as with complete, undamaged and salable contents. Furthermore there must be considered, in the packing of such commodities, the very great danger of pilferage, and in that regard reference should be made to other pages in this volume, in which protection against pilfering is more particularly dealt with.

One of the prominent American manufacturers of pharmaceutical products allows the reproduction of excellent photographs (see page 442) which give a good idea of the export packing which this manufacturer supplies. In further describing his packing he writes: "The first photograph represents a standard case of 18 dozen Hydrogen Peroxide in 4-ounce bottles. As to outside packing, this case is made up of 7/8" wood, reënforced at ends with 4" strips, as shown in the photograph. Each case is

strapped with a wide metal strapping, which is nailed every four inches. It is to be noted that all four sides of the case are made up with the least possible number of boards. As to the inside packing, each bottle is placed in its individual carton, 3 dozen packages being placed in a heavy carton packer with inner corrugated lining and corrugated partitions, within which each of the individual cartons fits snugly; the entire arrangement prevents movement of the packages, and also should one of the bottles by any chance become broken it is held in place by the corrugated partitions, thus preventing the movement and consequent breaking up of the balance of the contents while en route. Six cartons fit into the wooden case, which is practically built around them in such a snug fashion as to obviate necessity for straw or hay packing in between the sides. To take up the slight space which sometimes occurs in the top of the case, sheets of corrugated carton are simply laid in before the cover is nailed on.

"The second photograph represents a 12-ounce long neck, square bottle, and these, because of their size, are packed in standard shipping cases of 6 dozen each, put up in heavy corrugated cartons of 1 dozen bottles. In packing these we use an individual straw jacket or sleeve for each bottle; 12 fit snugly within the carton, which has an inner corrugated liner for added protection, and for preventing movement while en route, the jacket acting as a cushion between the bottles. A straw mat is placed in the bottom and on top of bottles in each packer."

Another well known manufacturer of pharmaceutical products submits several photographs of his export packing, reproduced on page 447, whose captions are self-explanatory. In these photographs there are to be noted the corrugated partitions dividing glass battles, the 2" outside layer of excelsior, the lining of waterproof paper, or hermetically sealed tin, etc.

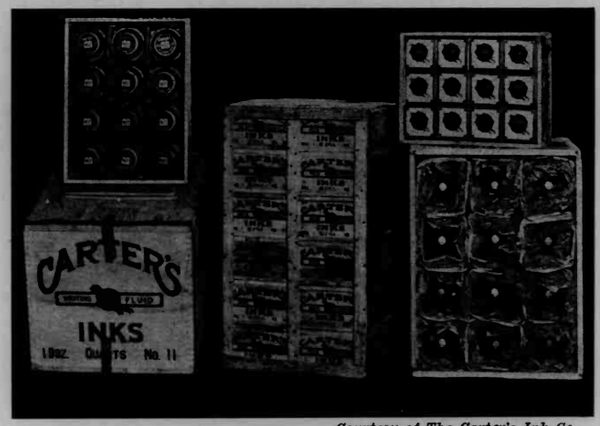
A New York export merchant, in writing regarding shipments of bottled goods for export, points out that corrugated sleeves or cartons can only be successfully

employed for packing bottles when the bottles are not so heavy that they are likely to break or flatten out the cartons. This result not only injures the salability of the goods, but allows the bottles very quickly to work loose and knock each other to pieces, and of course as soon as one bottle breaks all the rest are in danger. This exporter states that English manufacturers successfully used sawdust in packing small boxes, practically eliminating breakage.

One of the complaints received regarding the shipment of American food products in jars has been that the partitions used in dividing the interior of cases into pigeon-holes have not been strong enough, or firmly enough fastened, and preferably should extend from the top to the bottom of the box.

A well known American manufacturer of confectionery supplies a photograph (see page 448), explaining that the cases illustrated measure about 2¼ cubic feet, containing hermetically sealed glass jars in two layers of 36 each, the case weighing, gross, about 80 pounds. A mat of corrugated paper is laid on the bottom of the case, around all of the sides, and finally over the top, and corrugated paper partitions separate the jars so that they cannot rattle one against another, and the two layers of jars are separated by mats of corrugated paper. This manufacturer uses iron bands around each end and around the middle of his cases. It is suggested, however, that more thorough protection along lines just above indicated might conduce to safety in transit.

A manufacturer of writing inks submits photographs of his packing (see page 448), explaining that his quart bottles are enclosed in cartons made of corrugated board and strong brown paper, sealed top and bottom. The case itself, of strong, substantial lumber, is lined with corrugated board mats—top, bottom and sides. Two cases, each containing 1 dozen quarts, are strapped together with strong iron strapping, to make a single shipping package. The pint and half-pint sizes are similarly packed, only 4 cases of each are strapped together into



Courtesy of The Carter's Ink Co.

ANOTHER METHOD OF PACKING FLUIDS.

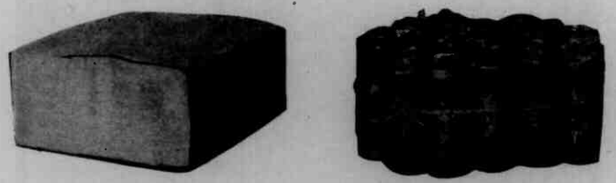
Bottles containing fluids or semi-fluids separated by sheaves of excelsior or partitions of corrugated board.

COMPARATIVE VOLUME OF 1000 LAMPS IN THE OLD AND NEW FORMS OF PACKING

Courtesy of International General Electric Co.

METHOD OF REDUCING VOLUME OF PACKAGE.

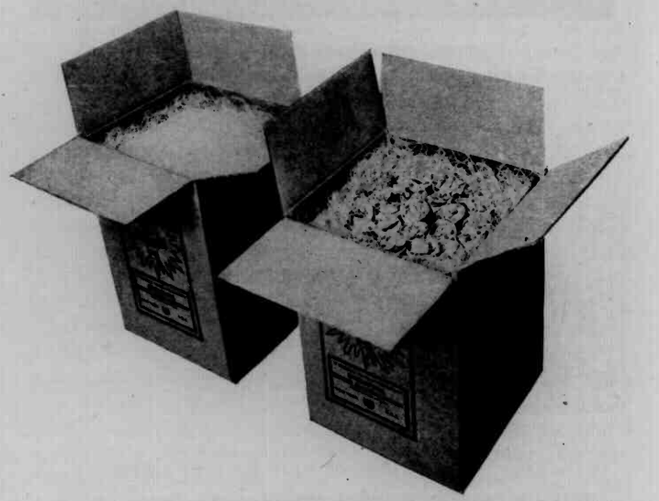
This drawing shows graphically the saving effected by a change in packing methods.



Courtesy of International General Electric Co.

(1) METHODS OF PACKING ELECTRIC LAMPS.

The new bundle, at left, wrapped in kraft paper presents, with its neat, secure compactness, a decided advantage over the old form of string-tied bundle.



Courtesy of International General Electric Co.

(2) NEW AND OLD FORM OF BUNDLES IN STANDARD BOX.

The paper bundle is better adapted to the square package than is the bundle tied with string. Note the uniform distribution of excelsior and the elimination of the wasteful corners in the improved method shown at left.

a single package. Other bottles, square in shape, are themselves quite strong, but are protected by 4 walls of corrugated board. They are packed in 4 layers of bottles, each layer containing 36, and layers are separated by corrugated board, with which also the entire case is lined.

Another manufacturer of inks, library paste, and other office preparations, illustrates his export packing by a photograph, reproduced on page 453, which shows both interior and exterior packing of glass bottles containing liquids or semi-fluids, having sheaves of excelsior, or separated by partitions of corrugated board. All goods are iron strapped, and cement nails and all possible precautions are employed.

Packing of Incandescent Lamps.—The effort in export packing of incandescent lamps has constantly been directed toward the problem of decreasing bulk just as far as such might be consistent with safety. The commodity in this case is extremely fragile, and the filament of the lamp is in turn fragile, it being quite possible to have a shipment go through without breaking the lamp, but with a considerable number of the filaments broken. The vital necessity for a proper package was thus quickly recognized, and one of the large makers of lamps has spent thousands of dollars in experimental work at the Forest Products Laboratory, at Madison, Wisconsin, and in its own laboratory, for the purpose of discovering the proper package.

The European practice differs considerably from the American, for the custom abroad has been to ship in large quantities in one container, whereas the American system makes a practice of shipping in small packages which are then enclosed in a large case. Indeed, the American package does not differ for domestic or foreign shipments, except to the extent that in foreign shipments the cartons are enclosed in cases, and we understand that foreign shipments have recently also been made in cartons. A large manufacturer and shipper of incandescent lamps, to whom the author is indebted for the cuts shown

with this article, sends the following information: "The best method of packing lamps for export shipment is, and has ever been, a very live subject with our engineers. Next to having a thoroughly satisfactory product to export, the most important consideration in foreign business is properly packing the product. Consequently this is a subject to which we are giving constant and careful thought, with a corps of experts devoting their entire time to this one problem, and conducting hundreds of tests and experiments in their effort to discover and adopt the very best methods.

"There are many factors entering into this problem, but generally speaking the two most important ones are: (1) Prevention of breakage. (2) Reducing size of package to the lowest possible minimum.

"Heretofore we have wrapped our lamps in what was known as a 'Champion' wrapper, consisting of a flat sheet of single-faced corrugated paper to which was glued a fly-sheet of manila paper, slightly wider and longer than the corrugated paper sheet. The lamps were rolled up in this wrapper, the manila fly-sheet tucked in at the ends, and the so-called 'bread and butter' sizes of lamps—60 watt and smaller—were then tied in bundles of 25 with a piece of string. The standard method was then to place four of these bundles, or 100 lamps, in a corrugated paper package (although wooden boxes were used when necessary). A different size of corrugated paper package was used for practically every different size lamp.

"These facts are more or less familiar to every one who may read this article, but for purpose of comparison with the new method, it is well that they be mentioned here.

"While this method of packing gave the lamps very good protection, there were certain features about it that were not the best, everything considered. For example:

"(1) The so-called 'Champion' wrapper was bulky, heavy, relatively expensive, and did not permit the lamps to nest. The last mentioned objection necessitated a relatively large package.

"(2) The tying of lamps in bundles with string was insecure. In removing the bundles from the package the string frequently came off, causing inconvenience, and possibly some breakage.

"(3) The bundles of lamps being round, did not properly fit the packages, which were square. This meant a great waste of space at the corners of the package.

"(4) The use of the many sizes of packages had obvious disadvantages.

"To discover a more satisfactory method of packing than that described above, eliminating the disadvantages of that method without sacrificing the protection to the lamp, has been our object, and with this end in view hundreds of tests have been conducted. We have been successful in developing a method that we consider vastly superior to the previous standard. Briefly, the new method is:

"(1) The lamp is wrapped in what is known as a 'Mid-ge' wrapper, consisting of a sheet of flat unfaced corrugated paper to which is attached a fly-sheet of Kraft tissue paper. Both the corrugated and fly-sheets are practically the same size as those in the 'Champion' wrapper, but in the 'Mid-ge' wrapper (a) They are lighter in weight; (b) The new wrapper permits the lamps to nest, economizing space; (c) It is less expensive than the 'Champion.'

"(2) The ends of the 'Mid-ge' wrapper, being of Kraft tissue, are twisted, giving decidedly more protection to the tips of the lamps than the 'Champion' wrapper, whose fly-sheet was manila and could not be twisted, but had to be tucked in.

"(3) The lamps, after being placed in the 'Mid-ge' wrapper, instead of being tied in bundles with string, are wrapped in Kraft paper, of which the ends are held together by gummed paper tape, giving a neat, compact, secure bundle, conforming in shape with the box. Fig. 1 illustrates very clearly the difference in general appearance and shape of the bundles of lamps in the Kraft paper and tied with a string. Fig. 2 shows how decidedly

better the paper bundle is adapted to the square paper package than the bundle tied with string, permitting a uniform distribution of excelsior and eliminating the wasteful corners. See page 454.

"(4) The 'Mid-ge' wrapper permits the lamps to nest, as they naturally should. The advantage of this from a shipping standpoint is evidenced by the fact that 30 S-19 bulb lamps in 'Mid-ge' wrappers can be packed in the same space as 25 in 'Champion' wrappers. Table No. 1 shows some interesting comparisons of sizes of packages required for the 'Mid-ge' and for the 'Champion' wrappers, with the saving in space effected with the former.

"(5) By some changes in standard package quantities we have been able to reduce to a very low minimum the number of sizes of standard paper packages that will be used. Hereafter we will pack S-14, S-17, S-19, S-21, PS-17 and PS-20 bulb lamps (possibly other sizes) in the same size package. There will be other similar consolidation of sizes. This has the following distinct advantages: (a) A reduction in weight and volume per thousand packed lamps, and a consequent saving in transportation charges and, in some cases, in duty charges. (b) A more flexible general warehouse stock, from a storage and a shipping standpoint. (c) The bundles of lamps will all be of practically the same size, which means that shipments of less than standard package quantities from agents' and subcompanies' stocks, can be quickly and efficiently packed and handled by placing the compact paper bundles of several different sizes of lamps in the one size standard package designed especially to fit the lot. This is an obvious advantage. (d) Where crating is necessary, but one size of crate will be required. The table No. 1 contains some very interesting figures on the saving in volume per thousand packed lamps effected by this consolidation of package sizes into one standard size.

"This saving in volume is shown in the drawing herewith (page 453). The new wrappers and paper packages will retain their same advertising value and will be

Courtesy of Willard Storage Battery Co.

FIRST PROCESS IN PACKING STORAGE BATTERIES.

Batteries are first placed in a light frame holding an average of five. For detailed description of the packing, see text.

Courtesy of Willard Storage Battery Co.

SHIPPING CASE FOR STORAGE BATTERIES.

The crate is placed in the shipping case and floated in excelsior.

INTENTIONAL SECOND EXPOSURE

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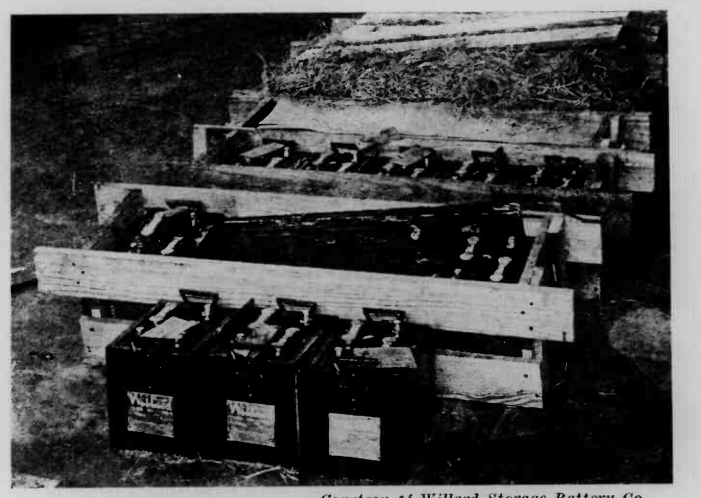
"(4) The 'Mid-ge' wrapper permits the lamps to nest, as they naturally should. The advantage of this from a shipping standpoint is evidenced by the fact that 30 S-19 bulb lamps in 'Mid-ge' wrappers can be packed in the same space as 25 in 'Champion' wrappers. Table No. 1 shows some interesting comparisons of sizes of packages required for the 'Mid-ge' and for the 'Champion' wrappers, with the saving in space effected with the former.

"(5) By some changes in standard package quantities we have been able to reduce to a very low minimum the number of sizes of standard paper packages that will be used. Hereafter we will pack S-14, S-17, S-19, S-21, PS-17 and PS-20 bulb lamps (possibly other sizes) in the same size package. There will be other similar consolidation of sizes. This has the following distinct advantages: (a) A reduction in weight and volume per thousand packed lamps, and a consequent saving in transportation charges and, in some cases, in duty charges. (b) A more flexible general warehouse stock, from a storage and a shipping standpoint. (c) The bundles of lamps will all be of practically the same size, which means that shipments of less than standard package quantities from agents' and subcompanies' stocks, can be quickly and efficiently packed and handled by placing the compact paper bundles of several different sizes of lamps in the one size standard package designed especially to fit the lot. This is an obvious advantage. (d) Where crating is necessary, but one size of crate will be required. The table No. 1 contains some very interesting figures on the saving in volume per thousand packed lamps effected by this consolidation of package sizes into one standard size.

"This saving in volume is shown in the drawing herewith (page 453). The new wrappers and paper packages will retain their same advertising value and will be



Courtesy of Willard Storage Battery Co.

FIRST PROCESS IN PACKING STORAGE BATTERIES.

Batteries are first placed in a light frame holding an average of five. For detailed description of the packing, see text.

Courtesy of Willard Storage Battery Co.

SHIPPING CASE FOR STORAGE BATTERIES.

The crate is placed in the shipping case and floated in excelsior.

Courtesy of Willard Storage Battery Co.

ANOTHER METHOD OF PACKING BATTERIES.

Batteries packed according to specifications of the United States War Department. Each battery placed in separate compartment and floated in excelsior.

Courtesy of National X-Ray Reflector Co.

METHOD OF PACKING GLASS REFLECTORS.

Reflectors are packed in standard cardboard cartons, each reflector contained in its own compartment. Excelsior is packed into each compartment, and the cartons are floated in excelsior when put in case.

marked with a description of the lamps as in the past.

"In closing, it might be of interest to state that our engineers were fortunate enough to get the permission of the Department of Agriculture of the United States Government, to conduct many of their tests in a special box testing machine in its Forest Products Laboratory. These and many actual shipping tests have demonstrated conclusively the superiority of the 'Mid-ge' wrapper method of packing from a standpoint of protection to the lamps. Other advantages we have attempted to point out in this article."

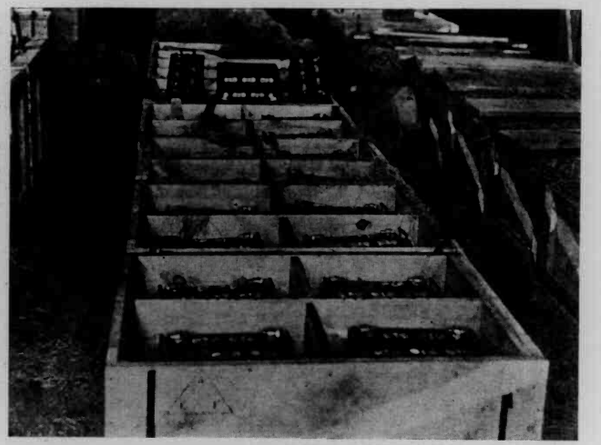
SAVING IN VOLUME BY NEW PACKING METHOD. TABLE NO. 1.

	OLD METHOD (CHAMPION WRAPPER)			NEW METHOD (MID-GE WRAPPER)			
Bulb Size	Standard Package Quantity	Outside Dimensions Standard Package	Volume per 1000 Lamps	Standard Package Quantity	Outside Dimensions Standard Package	Volume per 1000 Lamps	Per Cent Reduction in Volume New over Old
S-14	100	14 x14 x23	26.09 cu.ft.	250	17½ x17½x27	19.14 cu.ft.	26.6
S-17	100	16¼x16¼x24	36.68 cu.ft.	144	17½x17½x27	33.22 cu.ft.	9.43
S-19	100	17½x17½x27	47.85 cu.ft.	120	17½x17½x27	29.87 cu.ft.	16.6
S-21	100	18½x18½x31	61.39 cu.ft.	100	17½x17½x27	47.85 cu.ft.	22.0
PS-17	100	16¼x16¼x24	36.68 cu.ft.	144	17½x17½x27	33.22 cu.ft.	9.43

South American importers have reported that European manufacturers of electric lamps have usually packed in excelsior or straw, and have added pads of burlap on the exterior covers, with the intention of thus reducing the effect of shocks. This method of packing, however, is said to be gradually giving way to an imitation of the more modern American packing of lamps.

The specifications for packing of the General Engineer Depot of the United States Army include the following: "Incandescent lamp bulbs or lamp and lantern globes will be shipped in boxes of not over 25 cubic feet, all dimensions approximately the same. Two inches of excelsior will separate the contents from the inside of the boxing; a flat double-faced corrugated board will separate layers. Incandescent lamps will be cased in corrugated paper cylinders, and placed carefully so as to comfortably fill the layer; excelsior will be used where

INTENTIONAL SECOND EXPOSURE



Courtesy of Willard Storage Battery Co.

ANOTHER METHOD OF PACKING BATTERIES.

Batteries packed according to specifications of the United States War Department. Each battery placed in separate compartment and floated in excelsior.

Courtesy of National X-Ray Reflector Co.

METHOD OF PACKING GLASS REFLECTORS.

Reflectors are packed in standard cardboard cartons, each reflector contained in its own compartment. Excelsior is packed into each compartment, and the cartons are floated in excelsior when put in case.

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SAVING IN VOLUME BY NEW PACKING METHOD. TABLE NO. 1.

	Old Method (Champion Wrapper)			New Method (Mid-ge Wrapper)			
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The specifications for packing of the General Engineer Depot of the United States Army include the following: "Incandescent lamp bulbs or lamp and lantern globes will be shipped in boxes of not over 25 cubic feet, all dimensions approximately the same. Two inches of excelsior will separate the contents from the inside of the boxing; a flat double-faced corrugated board will separate layers. Incandescent lamps will be cased in corrugated paper cylinders, and placed carefully so as to comfortably fill the layer; excelsior will be used where

necessary for firm packing. Alternatively, well packed cartons will be boxed, and a space of two inches clear between cartons and box will be filled with excelsior or similar material. The excelsior will be in a compact and even bed, with no lumps."

Packing of Sundry Electrical Supplies.—Export packing of the electric storage battery, of the rubber cell type, presents an interesting problem, for we have here a commodity that is fairly fragile and at the same time comparatively heavy. The need, therefore, is for most careful protection against breakage and also for cases of sturdy construction that will guarantee safety to the contents under rough handling.

A house that has developed an excellent export trade sends the photographs shown on pages 459 and 460 and comments on them as follows: "In photograph 'A' you will find that the batteries are placed in a light frame holding on the average five batteries. You will note on the photograph that the batteries are separated from each other with corrugated paraffined cardboard, so as to minimize the jarring as much as possible. The cardboard is also put lengthwise in the crate, as you can see one in the photograph tilted up, purposely projecting. The next crate in the same photograph shows the batteries placed in the crate with the cardboard tucked snugly around. The third crate shows two sheets of tough waterproof paper laid on top of the batteries, and as the fourth crate shows, a quantity of excelsior is placed on top and nailed down securely; thus you can see the batteries are firmly held in the crate, being in addition protected by the excelsior from rough handling. You will note on this picture that the crate has side boards extending a few inches, which serve as handles. The object of this you can see on referring to the second illustration 'B,' which shows the actual shipping case made of ⅞" lumber. The handles on the crate serve for the packers to lift the crate with the batteries and place it in the packing case, on the bottom of which a quantity of excelsior has been placed; then the handles are sawed

off and excelsior is packed around with a paddle, as shown in the illustration where the man is just in the act of forcing this excelsior in between the sides of the case and the crate. After the excelsior has been well packed around, a quantity is put on top of the crate and the cover boards nailed down, after which the steel bands are fastened and the marking stenciled. We allow a space of about 2½ to 3 inches for the packing of the excelsior.

"As we have received many favorable comments on this manner of packing, which has been adopted after many experiments and variations in our methods, we feel that this is the most satisfactory way of shipping batteries abroad.

"The third photograph (page 460) might prove of interest also, as it shows the packing of batteries shipped under government specifications during the war. You can see from this picture that each battery is put into a separate compartment, there being ample room allowed for the packing of excelsior. These cases were made of 1" lumber, reënforced with steel bands, and then painted across the corners in certain colors so that this would automatically determine for what branch of the army they were intended. The photograph shows these batteries ready for shipment."

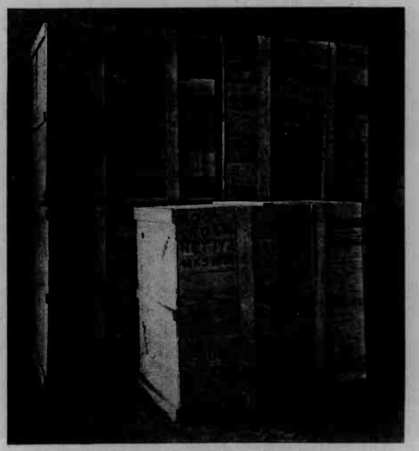
An American export house writes that one of its customers has complained of an instance where a manufacturer shipped battery charges and storage battery plates in one case, divided by a partition which was supposed to be solid, but which became loosened, and in consequence some of the charges were broken. This customer believed that the two kinds of articles should have been packed separately. This exporter also directs attention to the necessity of always carefully insulating all electrical devices made of porcelain with some sort of a cushion between the individual pieces which are quite fragile.

An official report recently received from Cuba declares that it is bad policy to ship elaborate glass chandeliers demounted, or in any respect knocked down, because the lower expense involved in freight rates is

more than offset by the cost of erecting, because Cuban dealers are not equipped to produce fine results in complicated work of this description. Some simple chandeliers and fixtures may be shipped knocked down, when it is possible to assemble them easily in local Cuban establishments. From China a complaint was recently received regarding a shipment of glassware for electrical fixtures sent out in cases made of ¼" lumber, with ends of ¾" stuff. Not only were the cases too light, but the lumber was of bad quality, and almost all of them arrived in broken condition. Indirect lighting bowls are often shipped three to a barrel, and although barrels arrived without apparent external damage, the contents are frequently broken, and importers believe it would be much safer to ship each bowl separately packed in a suitable case, with plenty of excelsior.

A well-known manufacturer sends photographs shown on pages 460 and 465, and writes: "We are sending you with this letter two photographs showing the methods of packing that we employ in our factory for export shipments. This particular shipment is one that is going to London, and consists of glass reflectors used for illumination of store windows and interiors by means of indirect illumination. One photograph, as you will note (page 465), shows five boxes all ready for shipment, with markings; the other photograph (page 460) shows box partly packed. You will note that the wooden box contains smaller cardboard cartons which are nested in excelsior. The method of packing the individual pasteboard carton is illustrated in the lower left hand corner of the photograph. In this particular case the cardboard carton has four compartments, in which the individual reflectors are nested, between the cardboard partitions and layers. We believe that the photographs, with the following descriptive notes, will be of service:

"As stated above, the individual reflectors are packed in standard cardboard cartons, with partitions and compartments that hold the separate reflectors apart. This cardboard carton is the same as used for domestic ship-



Courtesy of National X-Ray Reflector Co.

CASES CONTAINING GLASS REFLECTORS.

Note the strips on ends and middle of sides which tend to take jar occasioned by rolling or tipping of cases. For detailed description see text.

Courtesy of Eastman Kodak Co.

PACKING OF PHOTOGRAPHIC GOODS.

Note the double ends of cases. The material packed is separated from the walls of the case, and each piece from every other piece, by thick layers of excelsior. This case contains glass graduates.

INTENTIONAL SECOND EXPOSURE

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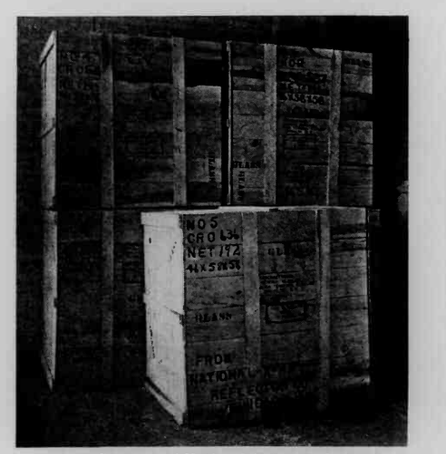

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Courtesy of Eastman Kodak Co.

SOLDERING A TIN LINING FOR CASE.

The tin lining provides an hermetically sealed package.

Courtesy of Geo. Borgfeldt & Co.

PACKING OF BRIC-A-BRAC.

Each article packed individually in paper and excelsior, placed in case in even layers, each layer covered by layer of excelsior. Note double ends of case reënforced by strip of lumber at each end.

ping. In order to further insure the reflector against chipping or abrasion, any spaces between the partitions and the reflector are filled up with excelsior, so that the reflector cannot move or shift in its position. This excelsior packing is not used in domestic transportation.

"The large export boxes are made of 1″ lumber, reënforced by 1″ lumber on ends, and bound in the middle with 1″ strips; so that when the box is rolled or tipped over, these strips will tend to take the jar, instead of allowing the box to receive a *flat slam,* which is more or less injurious to the contents. You will note in the photograph that the wooden boxes are bound with heavy strap iron at each end. The wooden box is large enough to allow the standard cartons to be floated in excelsior padding. The boxes are made about 4″ larger in each dimension than the actual dimensions of all of the cartons assembled. This space is very solidly filled with excelsior. It is our aim, in making shipments of this kind, to keep the size of the wooden boxes from becoming too large and heavy for convenient handling. We aim to keep to a dimension of not over 56″ for any side of the box, and a weight of about 500 pounds.

"The particular style of packing described and illustrated by the photographs has been used successfully for shipments going to Holland, Sweden, England, Japan, Australia, etc.

"As you already know, the outside of the boxes must be plainly marked to indicate the contents, especially if it is of fragile nature. It is our practice to place markings not only in English, but also in the language of the country to which the shipment is to be made, such as Swedish, Dutch, Japanese, etc. The address or destination is always given in the foreign language as well as in the American. This we consider a very important point. We feel that it is better to have more information than is required rather than hold up the shipment, which, in any case, requires a great deal of time."

A large maker of incandescent mantles, in a statement regarding his export packing, says that upright

INTENTIONAL SECOND EXPOSURE

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mantles are first packed in cardboard tubes, then in cartons containing either 12 or 25, according to the requirements of the market to which they are being shipped. Cartons are packed with a liberal supply of excelsior completely surrounding them, in heavy cases lined with waterproof paper, and all cases are carefully strapped and cleated.

Packing of Photographic Plates and Glassware.—What is probably the largest American concern engaged in the manufacture of photographic cameras and supplies, declares that it takes the greatest possible care at all times to ensure that its export packages shall be durable, and suitable for the transportation requirements of the countries to which they are shipped. Cases are usually of ⅞" lumber, tin-lined, and hermetically sealed throughout (see cuts pages 465, 466). Heavy strapping surrounds the cases, and is always sealed. Wherever feasible, a standard case of from 12 to 16 cubic feet capacity is used. The lumber for this is mitred and nailed with special rosin nails. For the coast ports of Venezuela, cases of smaller and lighter construction (from 6 to 7 cubic feet) are used, in order to facilitate handling, and of course where muleback transportation is to be considered, as in Colombia, cases are made not to exceed 150 pounds in weight. Where there is liability of breakage, the material in cases is separated from the walls, and each piece from every other piece, by thick layers of excelsior. Furthermore, cases containing photographic plates and chemicals in glass are limited in size to about 3½ cubic feet, so that when sealed they will not weigh more than from 200 to 300 pounds.

The specifications for packing issued by the General Engineer Depot of the United States Army included the following paragraph, which should be noted in this connection: "Cameras and photographic supplies requiring such treatment should be hermetically sealed, either in an asphalt-treated cotton fabric—where necessary, asphalt or pitch sealed, lapping at least six inches—or in a waterproofed container approved by the Depot, taped

over the joints, and with a coat of China wood oil over these."

Export Packing of Bric-a-brac and Fragile Sundries.—A large New York exporter, handling a great variety of bric-a-brac, and all kinds of fragile goods, provides us with a number of interesting photographs (see pages 466, 556, 585), and states that export packing consists mainly in finding suitable cases, strong enough and roomy enough to contain the materials, snugly and tightly packed. All cases, except those to contain chinaware, are lined with waterproof paper, and each item is separately padded. The case itself is floored with excelsior, and the items are placed in and very tightly packed between layers of excelsior. The cases are reënforced inside with a long piece of lumber nailed very tightly, so as to prevent the case collapsing in case a heavy load is placed on top of it. Cases are iron-strapped, pulled tight by machine and sealed. End straps are nailed into the case, but straps about the middle of a case are merely pulled very tight, and not nailed. All bric-a-brac is packed individually with paper and excelsior, laid in the cases in even layers, and thoroughly protected all around by excelsior. Each piece of bisque bric-a-brac is padded carefully to fill in the spaces between the parts of the ornament, wrapped in excelsior and paper, and large pieces are padded in layers. Bronze pieces of bric-a-brac are also padded, usually by bands of excelsior-wrapped paper. Cases employed by this manufacturer frequently have double ends, and are also often reënforced by wooden battens at the ends. In a general way, the packing of these fragile articles of bric-a-brac may be described as thorough "floating" of the goods in their outside containers.

CHAPTER XVII

EXPORT PACKING OF TEXTILES AND APPAREL

JOHN S. LAWRENCE recently stated that, "Four and a half years ago we studied our Federal tariffs and probable imports, today we look to our foreign markets and probable exports in anticipating our industrial conditions. * * * * * * The responsibility of caring for the world's needs has come to us through the misfortune of others, and with it we have undertaken a new obligation. The permanency of this business will depend upon the degree of 'sane, sound service' rendered by our United States industry in the next few years." The author does not know that it has ever been his good fortune to see expressed more concretely the international situation of any industrial branch.

From 1890 to 1914 the United States consumed 31 to 38 per cent of its own cotton crop, but the statistics for the war years show a very rapid increase of demand at home for the approximately 12,000,000 bales produced in the United States. In 1915-1916 we used 53 per cent of the domestic crop; in 1916-1917, 54 per cent; in 1917-1918, 58 per cent. This means that British spindles are being robbed of the raw material that has given England the lead in world trade for so many years, and it also explains the very determined efforts that Great Britain is now making to foster cotton growing within her own domains and thus make herself independent of foreign countries in the matter of raw cotton supplies.

The foregoing paragraphs will be of interest to any man interested in foreign trade in textiles, but it all has reference to the past and will be meaningless for the future unless the proper work is done to hold the ground won and by "sane, sound service" make a good fight

for world markets. As an absolutely necessary element of this good service must be included good packing, and as a necessary element the packing problem demands the most careful and painstaking study.

Packing of Textiles.—The packing of textiles offers a large variety of interesting technical angles. There is the question of customs requirements, which as applying to textiles are of the most exacting character. The arrangement of the goods in the case and the character of the case has a most important influence on the laid-down cost of the goods. There is further the protection of the goods, and above all, the necessity of doing everything possible to prevent pilfering. Textiles, unlike a great many goods, are merchandise of instant use in any country, and there are comparatively few other lines that offer the universal and constant attraction to the pilferer.

Textiles is, of course, a generally comprehensive term and applies not only to cotton piece goods but to silk, woolen and other goods in the piece, of which in recent years the United States has come to rank as an important exporter. It seems probably true that English shippers have brought to bear on the question of the export packing of textiles a good deal more thorough and scientific study than we in the United States have up to the present bestowed on this subject. Indeed, the export packing of cotton textiles is, it is understood, a distinct branch of industry in Manchester, in which are engaged specialists devoting their attention to nothing else than the packing for export of the tremendous volume of export business enjoyed by Manchester and other British firms of exporters. Market peculiarities are quite thoroughly studied and generally understood, and the packing of textiles by these Manchester specialists is said to follow more or less standardized lines—in the making of bales, for example. In many instances, double if not treble the hydraulic pressure is brought to bear in compressing the contents than is employed by American shippers, with the result that bales are made to occupy not to exceed two-thirds of the cubic space of an American bale containing

similar yardage. This perhaps is especially true in shipments of certain varieties of cotton piece goods to British India, where long established custom has developed the practice of compressing the several pieces into bales while still damp, and even soaked, with the sizing liquids employed, utilizing very heavy hydraulic pressure, with the result that when the bales are opened in India each piece is as stiff as a board and the folds of the cloth have almost to be torn in unwrapping the pieces. Practices such as this vary with different markets and, of course, have to be learned with the course of long and intimate acquaintance with market peculiarities and the wishes of customers. It is notable, however, that British packers invariably charge for the special packing supplied, while the usual practice of most American shippers is to supply packing without cost. There is, or at least used to be before the war, a more or less standard packing price-list in vogue among the Manchester packing houses, and charges for packing of various descriptions—bales, cases, tin linings, etc.—as made by British shippers were widely understood and accepted. Whether it might be better for American shippers to go deeply into this subject of the export packing of textiles and impose charges for packing which would deliver goods to the better satisfaction of customers, or with considerably reduced freight charges, may be a subject for discussion. The volume of American export business has become so tremendous that economies offered customers for their better satisfaction in one way or another have become matters of the highest importance to us.

Use of Cases and Bales.—As illustrating American packing methods at present in vogue among shippers doing a very large export business, the following quotations from correspondence which has been received will be of value.

A house doing an international business writes: "Cases.—For countries where case packing is permissible, we use ¾-inch new cases, line these inside with good heavy paper and protect the outside by iron strapping. The number of straps varies according to the size and weight of cases, but it is hardly ever less than three. To ports in which unloading is difficult, in other words, where steamers cannot dock at piers, but must stay outside and the cargo has to be unloaded into lighters, we usually employ waterproof paper as a lining in order to avoid damage in case a parcel is dropped into the sea in the unloading process. Cases going to countries with a very humid climate are tin lined. This tin lining is also employed for shipments to certain Far Eastern markets where merchandise in cases has frequently been damaged by a class of vermin eating into it. We employ tin lining entirely on all shipments to Korea.

"Bales.—Packing in bales is demanded by customers for two reasons. The first reason is that duty is assessed on the gross weight, and for that reason naturally the customer wants to have his tare as light as possible in order to keep down the amount of duty he has to pay. In this case, we make bales as large as we can possibly make them consistent with their safe arrival. We employ a large power press to compress bales, then wrap the entire parcel in strong paper, over which goes a layer of oilcloth and outside burlap. The outside is then provided with not less than four iron straps. To avoid damage to the merchandise we put under the layer of burlap a light board of exactly the length of the bale. This board at the same time prevents cutting of the strapping into the merchandise.

"The second reason for packing in bales is that certain markets do not have railroad connections with the ports, and merchandise has to be transported on mule-back. In that case a certain weight must not be exceeded. The weight given by various merchants as a limit varies—but we have found that for the interior markets of South America such as Colombia, Bolivia, etc., to cities without railroad connections, the customary limit given is about 50 kilos. The make-up of these bales is the same as in case one."

Another large textile exporting concern sends a num-

ber of excellent photographs (see cuts pages 479 and 480) and states that the ordinary baled goods are lined with heavy manila paper and covered with burlap. For mule-back transportation and better grades of goods, the bales are lined with paper, oilcloth and burlap, and in certain cases tarpaulin is used. The cases are all of new wood and are wire strapped, as in practice this house believes it has been demonstrated that the wire strap is better than iron straps. The captions of the photographs in question are self-explanatory.

Packing of Wool or Hair.—Of value to shippers of other textiles than those of cotton will be the following excerpt from the Standard Specifications of the War Department for the shipment overseas of army supplies during the war.

"Boxes containing articles with components of wool or hair shall have a liberal amount of naphthaline (not less than one-half pound per box) sprinkled evenly throughout the contents. Naphthaline must be furnished in flaked or crushed form. Particles must be large enough so that they will not adhere excessively to the cloth or material when it is shaken. The product must be white and must not turn brown after exposure to the air for a period of time. On ignition it shall be completely consumed, leaving no residue. It must be completely soluble in boiling alcohol. The solidification point shall be 79.5 degrees C. Material having a solidification point less than 79 degrees C. will be rejected.

"When necessary, a lining of moth-proof paper shall be used in addition to the naphthaline, and it shall be placed between the waterproof paper and bogus paper linings. This moth-proof paper shall contain either a coal tar, naphthaline oil, or red cedar oil saturant, and shall be paper with a strong odor. When its use is considered necessary it will be specified."

Criticism of Textile Packing.—Many criticisms of American packing of textiles which have been received from correspondents and importers in other markets of the world will assist in shedding light on what we do

that we ought not to do and what we do not do that we ought to do. Strenuous complaints have been received from Manila of the continual arrival at that port of goods whose consignees cannot be identified because of the mutilation or destruction of their frail containers. We have before us a photograph which illustrates what was originally a bale of white goods packed in jute with metal bands. This bale with many others was sold by the customs authorities in Manila because it was impossible to identify it, having arrived entirely stripped of its covering and bands.

Importers of American cotton drills in Ceylon say that when these goods arrive by direct steamer they are in fairly good condition, but when transhipment has been necessary the coverings of the bales are torn and almost all bales are open at the ends. Complaint is made that the pieces of cloth on the bottom of the bales which come in contact with the floor for a time are found to be spotted and damaged. This is attributed to the insufficiency of the wrapper.

Complaints from the Far East.—Experienced importers of American textiles in China report that such piece goods as sheetings and drills are frequently shipped with merely a sheet of packing paper and at most two wrappings of a very poor quality of burlap. Colored goods are shipped in wooden cases, mostly of very common wood, with merely a brown paper lining, consequently the merchandise more often than not arrives at destination in pretty bad shape. European manufacturers ship gray goods, or what are known in America as brown cottons, in bales, the wrapping of which consists of a heavy packing paper, a waterproof lining paper, tarred canvas and a good quality of burlap covering, while colored goods are invariably shipped in tin-lined cases. It is probable that there have been more claims for damage on cotton goods than upon all other kinds of American goods shipped to the Far East. The packing of American domestics is criticized as too lightly pressed, while the wrappers consist of a single paper

(generally very thin) and gunny covers bound with rope bands, and, when sent in double bales, the bales are usually trussed with thin steel bands of about ¾ inch by No. 24 gauge. The wrappers are inadequate to prevent damage by liquids. In comparison with American bales, the English goods are heavily pressed and the wrappers consist of three layers of stout paper, prepared canvas, layer of brown paper, and outer wrapper of gunny, bound with steel bands of 1½ inches by No. 13 gauge. This packing renders the contents secure against small liquid damage, and it is difficult for hooks to penetrate past it.

The most serious damage by steel bands is due to their becoming twisted because of the small gauge of steel, with the result that the edge, which is knife-like, may easily cut other bales while in stowage. This damage is fairly common and is accounted for by the swelling of the contents of the bales which overlap the edges of the bands. A very common damage is that caused by oil stains. Some damage is due to the bales coming in contact with wheels and axles of cars when loaded, or it may be from coming in contact with the winch or the winch chains on board ship. Paper lining of bales is absolutely useless in preventing the oil from penetrating to the contents, and in many instances the packing paper is of an absorbent nature and actually accelerates the damage. The effect of the damage to gray goods is that dye will not take where the oil has touched. If the wrappings of bales do not extend all around them, covering all sides, or are broken open because the rope bands have disappeared, damage ensues from mildew and dirt stains.

At Shanghai the practice prevails of stripping the ropes and hoops from bales of piece goods stored in godowns or loaded on the coasting steamers. These "impertinences" to bales have formed a regular source of revenue to certain classes of Chinese employees.

From Bombay it is reported that American drills are not sufficiently protected by their packing from cuts and tears. American packing consists of a Hessian cloth and

some paper, whereas the usual packing of English piece goods consists of Hessian cloth on the outside, then a tarpaulin and a thick gunny, with paper inside. English bales are also larger, heavier and more compactly pressed than are the American bales of drills.

Of drills shipped in cases, importers on the east coast of Africa complain that American packing only consists of a layer of paper, and that the boxes themselves are too light for their weight, which ranges from 250 to 300 pounds. Unbleached sheetings from the United States are shipped in bales wrapped in gunny, secured by ropes, 9 to 13 ropes to a bale; inside there is a wrapping of paper, and the ends of the bales are loosely sewed. The foreign bales, usually containing kanikis and kangas (women's garments), which are generally packed in gunny, are secured by iron bands, and the ends are very carefully and closely sewed; moreover, there is an inside lining of waterproof paper. In many of the English bales there is a thin wooden piece set at each end, giving greater rigidity to the bales and decreasing the danger of damage should the ends become torn.

Emphasis is laid on the necessity for good end sewing, for it is generally at the extremities that American bales come open. The chief weakness of the American bale is the end sewing; the rope ties seem adequate, though not so good as the iron; but the inside casing of waterproof paper is badly needed. If an iron tie is used, the waterproof inner coating is essential to protect the cottons from rust.

English Method of Baling.—All cotton goods are imported into Honduras in bales to save cost. The English charge 4 shillings for packing a 60-kilo bale, but they pack it much tighter than the Americans, so that their bales are not over two-thirds the size of those from the United States containing the same quantity of goods. This not only gives an advantage in freight rate but is also a protection to the goods under the rough handling they receive in their trip to the interior. The English interline with tarred burlap and bale with ties, while the

American exporters interline with oilcloth and bale with ropes. The ties are preferred, as ropes are occasionally cut en route. The merchants state that if thick enough, oilcloth is all right, but that frequently it is too thin or is old stuff that has holes in it and does not protect the goods. For good oilcloth the merchants are able to get a little additional, but they cannot do this if it has previously been worn out in the United States. During the rainy season goods are brought up country in ox carts or by muleback in the heavy rain, and if the marks and numbers are not heavily stenciled they are illegible by the time the goods arrive in the interior.

All cotton goods shipped to Salvador come in bales. American bales are wrapped in paper and oilcloth, sometimes only in brown paper around which is put the outer burlap. The English first use paper, then ordinary burlap, then tarred burlap and then the outer burlap, which makes the bale almost watertight.

Most of the cotton goods for Bolivia comes in bales weighing under 100 pounds, or at least under 125 pounds. Frequently several small bales are strapped up in one bale for import to the towns and then divided for shipment to the interior.

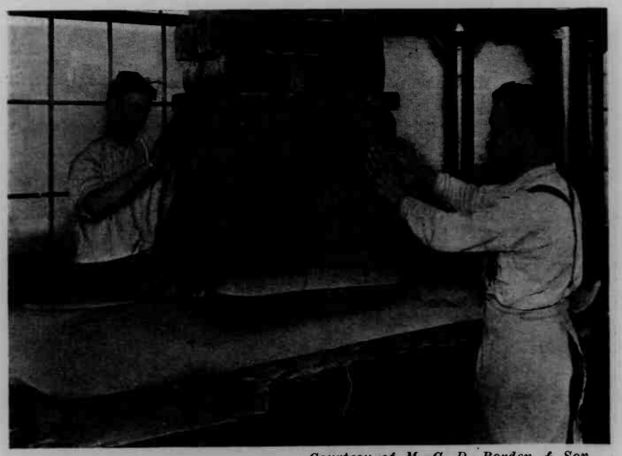
Indicative of the restraints that packing requirements have imposed, it may be noted that the preference in Colombia for piece goods 26 to 28 inches in width had its origin in the custom of making bales of cloth for muleback packing 26 to 28 inches long so as to prevent the iron strapping of the package from chafing the thighs of the animal. Furthermore, prints and dress goods are put up in bolts containing either 10 or 30 yards, the former quantity being sufficient to complete the garment desired by the purchaser, and the latter for the retail-counter trade.

All of the houses in Maracaibo, Venezuela, which import dry goods, complain against the use of hooks on bales of cotton piece goods. They assert that eight out of every ten bales contain damaged pieces of cloth with holes cut by the bale hooks. One house states that its

Courtesy of M. C. D. Borden & Son.

BALING OF TEXTILES.

Bale is in position and is about to be placed under pressure.



Courtesy of M. C. D. Borden & Son.

BALE UNDER PRESSURE.

Bale shown in this photograph is under a pressure of 2,000 lbs. per square inch. Burlap is being sewed on all sides.

INTENTIONAL SECOND EXPOSURE

American exporters interline with oilcloth and bale with ropes. The ties are preferred, as ropes are occasionally cut en route. The merchants state that if thick enough, oilcloth is all right, but that frequently it is too thin or is old stuff that has holes in it and does not protect the goods. For good oilcloth the merchants are able to get a little additional, but they cannot do this if it has previously been worn out in the United States. During the rainy season goods are brought up country in ox carts or by muleback in the heavy rain, and if the marks and numbers are not heavily stenciled they are illegible by the time the goods arrive in the interior.

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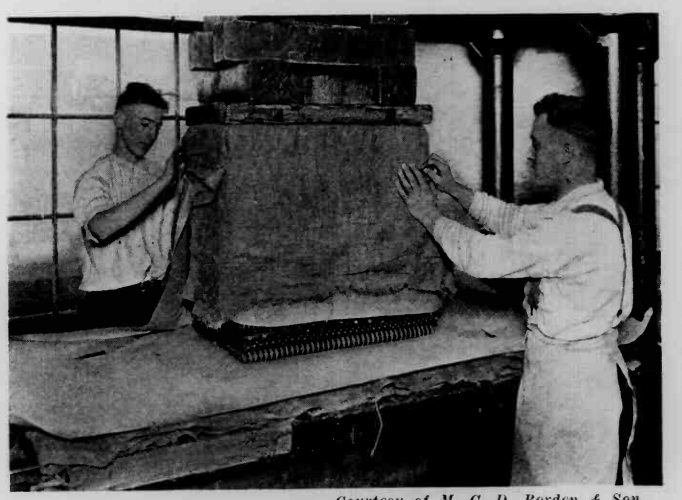

Courtesy of M. C. D. Borden & Son.

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Bale shown in this photograph is under a pressure of 2,000 lbs. per square inch. Burlap is being sewed on all sides.

Courtesy of M. C. D. Borden & Son.

STRAPPING OF BALE.
Iron straps being tightened.

Courtesy of Peck & Hills.

WICKER CHAIRS READY FOR PACKING.
Pile of knocked down chairs, ready to be measured for crate or case.

individual damage from this cause amounts to over $200 every year. In shipping white goods, prints, etc., oil-cloth or burlap should be interposed between the paper and the outer burlap. In shipping gray goods, however, this is not thought necessary by these importers and is always omitted by Americans, as it saves in first cost and duty.

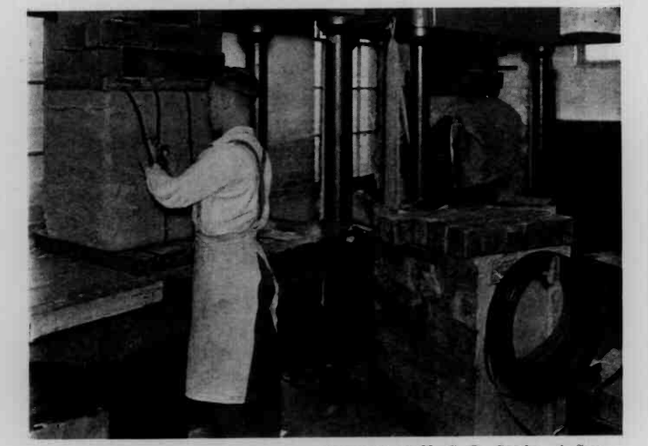
From Buenos Aires it was not long ago reported that buyers of supplies for local shoe factories complained of the American practice of shipping textiles for shoe linings in cases instead of in bales. A long correspondence was necessary before the manufacturers in the United States could be made to understand that the contents of 20 wooden cases might be packed into 16 cases if the pieces were heavily compressed, while identically the same yardage might be shipped in only 8 bales, effecting a very important saving in freight rates.

Book Cloths.—A large exporter writes: "On large export shipments of book cloth the ordinary wooden case used measures 39″x20″x20″ inside, and contains about twenty-five rolls of book cloth, approximately sixty yards to the roll. This case, outside measure, has a displacement of 9 7/10 cubic feet.

"Special cases of all sizes are made on smaller shipments—cases holding from one or two to twenty-five rolls each. Each case is double and sometimes triple lined with a good quality of heavy waterproof paper; is securely fastened by the use of nails and strapped about with heavy iron straps. Each individual roll of cloth is wrapped nearly the full length in paper, but this is done for domestic as well as export shipping."

Packing of Knit Goods, Hosiery, etc.—A prominent manufacturer of hosiery says in a letter to the author: "First. We pack our merchandise as is desired by our customers. In countries where import duty is paid on gross weight, naturally they require shipment in bales, and in that case each dozen of hosiery is first wrapped in white, grease-proof paper, and then bundles of about 25 dozen are wrapped in waterproof paper, and possibly

INTENTIONAL SECOND EXPOSURE



Courtesy of M. C. D. Borden & Son.

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four or six or eight bundles placed together, forming a bale, which is again made waterproof, then covered with 1-inch mesh chicken wire, after which the bale is thoroughly covered with burlap. This chicken wire is for the prevention of theft, and we have found it very effective.

"Second. In other countries where duty is not paid on gross weight, but when ocean freight is paid on a basis of cubic measurements, we again wrap each dozen in white grease-proof paper, packing same in a seaworthy case, lined with waterproof paper to prevent damage from moisture. This is the method generally employed in most South American countries.

"To Europe generally, however, regular packing is required. By that we mean each dozen of our cotton numbers are put in boxes of one dozen, silk numbers being in boxes of one-half dozen. These boxes or cartons are then packed in a seaworthy case thoroughly lined with waterproof paper. In every instance, however, the sea-going cases are specially built for each individual order and are of ¾-inch soft wood with double heads, and any case of 30 inches in length or over is reënforced on all four sides with battens, and in every instance is bound with iron strapping.

"In the case of parcel post shipments, generally each dozen is wrapped in white grease-proof paper, and then built into a package of the proper size, so as to remain within the limits of gross weight, and thoroughly covered with waterproof paper. In some countries, however, Cuba particularly, our regular boxing is employed, and then built into a package to remain within the limits of gross weight, thoroughly covered with waterproof paper."

A large exporter of silk and cotton gloves, silk hose, silk underwear and cotton-ribbed underwear, writes:

"We build a new case for every shipment and according to the necessities of each shipment; we use no standardized case, but they are all built of new ⅞-inch lumber (white pine) and strongly strapped with heavy metal strapping and, in the case of silk goods going to South

Africa, tin-lined besides. We have rarely had complaints of goods arriving in bad condition, although we have had many cases of goods pilfered en route even from tin-lined cases. We do not charge for ordinary export cases, but tin lining is charged at cost.

"As stated before, we have no standard size case, but build each of a size to suit the particular lot that is to go out, and thus the customer never has to pay freight on a lot of wasted space, for, of course, all our goods go by cubic measurement and not by weight.

"Unless the article to be shipped is of an unvarying standard size, standard shipping cases should be avoided, as it so often means that the consignee has to pay for several cubic feet of excelsior or old paper.

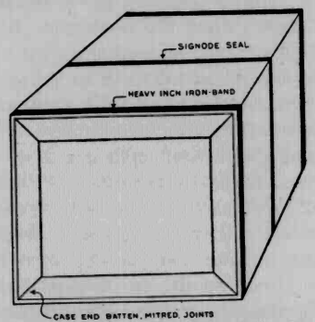
"Great care should be taken in ascertaining the exact net, legal and gross weights of each case, and where different classes of merchandise are packed in the same case the net and legal weights of each grade of goods should be shown; in fact, many merchants ask that the net and legal weights of each style in the consignment be shown, as it greatly assists them in figuring their costs. Too much stress cannot be laid on the necessity of exact accuracy in weighing goods, as in most countries duties are collected on the net or legal weight, and a wrongful declaration means a heavy fine for the consignee, which he naturally will expect to be reimbursed for by the shipper, and unless the shipper is willing to lose a customer he will have to pay it.

"Cases should be marked plainly, a stencil should invariably be used; some countries demand it; and no advertising matter should be shown. Customers' instructions as to marking and numbering should be strictly followed. Net, legal and gross weights in pounds and kilos to be stenciled in, as also measurements.

"When shipping to points where there are adequate port facilities dry goods should be packed in as large a case as possible consistent with strength and as long as it is not too heavy. For instance, we have shipped knit underwear (cotton) to Norway in cases 49″ x 37″ x 34″,

containing 127 dozen garments, gross weight 445 pounds or 201.85 kilos.

"Great care should be taken in ascertaining the methods of calculating duties in the country the shipment is going to. Where duties are based on net weights, goods such as hose, gloves, etc., can be shipped in cartons; where duties are charged on legal weights, all cartons, labels, etc., have to be omitted and the goods packed in bulk, each dozen wrapped in tissue paper and each six or twelve dozen so wrapped, again wrapped in strong but very light paper. Where tin lining is not used, the



Courtesy of Bech, Van Sicien & Co., Inc.

case should be lined with good waterproof paper, but care should be taken that this paper does not contain too much tar, as this is liable to sweat going through the tropics, and if the contents are dry goods will stain the goods. We had a case of this the other day and have changed our waterproofing papers."

A New York export merchant suggests that bales containing small articles of wearing apparel, dry goods, hosiery, etc., should always be strapped both ways, and that in shipping to some countries it is even advisable to line the bales with poultry netting as a protection against pilfering. This merchant believes that all bales should be lined with oilcloth, which he regards as the greatest protection against oil and water stains.

Shipping of Textiles.—Another large export merchant, shipping chiefly textiles, sends copies of packing instructions sent to mills with which export orders are placed, which may be commended to the most careful study of the reader. This house submits a typical diagram of the shipping case desired (see cut, page 484), the instructions reading as follows:

"The following instructions apply to shipments of silk hosiery and similarly valuable commodities where values of shipments are so great as to warrant the most expensive waterproof and pilfer-proof packing as the best economy.

PACKING INSTRUCTIONS—CASES—STYLE 1

"(Not to be used if contents' weight exceeds 500 pounds or cubic measurement exceeds 27 feet, when packing must conform to our instructions Style 4.)

"Make of new wood not less than ⅞ inch in thickness. Waterproof, line with tar-coated paper and strap with strong 20/22 gauge hoop iron, one inch wide bands, to be tightly drawn and sealed about ends, nailing with 3" nails placed every four inches. Use band ¾" in width with signode seal applied about middle.

PACKING INSTRUCTIONS—CASES—STYLE 2

"(Not to be used if contents' weight exceeds 500 pounds or cubic measurement exceeds 27 feet, when packing must conform to our instructions Style 4.)

"Make of new wood not less than ⅞ inch in thickness. Waterproof, line with table oil cloth and strap with strong 20/22 gauge hoop iron one inch wide bands, to be tightly drawn and sealed about ends, nailing with 3" nails placed every four inches. Use band ¾" in width with signode seal applied about middle.

PACKING INSTRUCTIONS—CASES—STYLE 3.

"(Not to be used if contents weight exceeds 500 pounds or cubic measurement exceeds 27 feet, when packing must conform to our instructions Style 4.)

"Make of new wood not less than ⅞ inch in thickness. Line cases with tin and hermetically seal, and strap with strong 20/22 gauge hoop iron one inch wide bands, to be

tightly drawn and sealed about ends, nailing with 3″ nails placed every four inches. Use band ¾″ in width with signode seal applied about middle.

PACKING INSTRUCTIONS—CASES—STYLE 4-1

"Special for unusually large cases or where weight is excessive.

"Make of new wood not less than 1 inch in thickness, with 6″ wide by 1″ thick end battens nailed to case ends, properly and closely fitted to give strong support for side board end nailing.

"These battens to have mitred and not straight joints to prevent the case from opening up because of swaying side motion in a sea-roll.

"Waterproof line with tar-coated paper and strap with strong 20/22 gauge hoop iron one inch wide bands, to be tightly drawn and sealed about ends, nailing with 3″ nails placed every four inches. Use two bands ¾″ in width with signode seals, and apply evenly spaced about middle.

PACKING INSTRUCTIONS—CASES—STYLE 4-2

"Special for unusually large cases or where weight is excessive.

"Make of new wood not less than 1 inch in thickness, with 6″ wide by 1″ thick end battens nailed to case ends, properly and closely fitted to give strong support for side board end nailing.

"These battens to have mitred and not straight joints to prevent the case from opening up because of swaying side motion in a sea-roll.

"Waterproof line with table oilcloth and strap with strong 20/22 gauge hoop iron one inch wide bands, to be tightly drawn and sealed about ends, nailing with 3″ nails placed every four inches. Use two bands ¾″ in width with signode seals and apply evenly spaced about middle.

PACKING INSTRUCTIONS—CASES—STYLE 4-3

"Special for unusually large cases or where weight is excessive.

"Make of new wood not less than 1 inch in thickness, with 6″ wide by 1″ thick end battens nailed to case ends,

properly and closely fitted to give strong support for side board end nailing.

"These battens to have mitred and not straight joints to prevent the case from opening up because of swaying side motion in a sea-roll.

"Line cases with tin and hermetically seal, and strap with strong 20/22 gauge hoop iron one inch wide bands, to be tightly drawn and sealed about ends, nailing with 3″ nails placed every four inches. Use two bands ¾″ in width with signode seals and apply evenly spaced about middle.

PACKING INSTRUCTIONS—BALES—STYLE 1

"Waterproof with tar-lined paper, strap with strong iron bands and use signode sealing. Bales to be hydraulic pressed.

PACKING INSTRUCTIONS—BALES—STYLE 2.

"Waterproof with table oilcloth, strap with strong iron bands and use signode sealing. Bales to be hydraulic pressed.

PACKING INSTRUCTIONS—BALES—STYLE 3

"Waterproof with double table oilcloth and tarpaulin. Strap with strong iron bands and use signode sealing. Bales to be hydraulic pressed.

"Markings for all cases and bales of every description: Stencil all bales with markings as per order copy in letters or numbers not less than 2½ inches high. Mark on both ends. Mark also with gross, legal and net weight in kilos (if possible). Also mark with cubic measurement of each bale or case."

This house further comments: "We anticipate your criticizing us for leaving off side battens of wood under strap iron bands from our case specifications. We are doing this for three reasons:

"First.—The heavy gauge strap iron nailed with 3″ nails we believe to be equally protecting.

"Second.—The American mills' domestic cases are not battened. Therefore, the use of battens would present a difficulty for them to adjust themselves to with readiness.

"Third and last reason is that these battens use up additional ship space, causing an added freight cost anywhere from 50 cents to $2.50 a case that seems to us a waste not compensated for by the added protection.

"The mills of this country are now showing a very accommodating spirit regarding packing exactly as the export trade desires. There is no contrary spirit to contend with today, whatever may have been the past condition. The extra cost of export packing will be charged for."

CHAPTER XVIII

PACKING FURNITURE

EXPORTS in 1919 of American metal and wood furniture were some $7,819,025, as compared with $5,349,320 in 1918, and whereas the growth is considerable, it could well have been produced by those conditions which have brought about expansion in the foreign trade in general of the United States. Therefore, there is no reason to explain the situation by alleging superior merchandise or increased interest on the part of shippers. The writer believes, however, that American trade in steel and wood furniture has a very large "spread" that it has not yet covered, and certainly the business in office furniture could be very materially increased with adequate attention to the work, and determination to build up foreign sales.

In the furniture trade abroad there are a great many competitive considerations that the American exporter has to face. There is the question of style, which varies greatly in different countries and which frequently is influenced by many factors; local factors, such as those present in different South American countries, and foreign influences, like that of France, in many parts of the world. In addition there is local production which must be taken into account, for woodworking is one of the oldest trades, and skilled men are found in almost every country. To be sure this latter consideration does not apply, in many countries, to steel furniture, as this is an industry of comparatively recent development and requires both equipment and special training for its development.

Faulty Packing Practice.—However, it would seem that the American manufacturer has to contend abroad

chiefly with his own bad packing, and from many different quarters unfavorable testimony on this point is available. Characteristic of this testimony are certain statements in Harold E. Everley's report on the "Furniture Markets of Chile, Peru, Bolivia and Ecuador," recently published by the Bureau of Foreign and Domestic Commerce, in which stress is laid upon the paramount necessity of good packing in foreign shipments of furniture. Speaking of Chile, Mr. Everley writes: "One of the requirements of the furniture trade with Chile is better packing. American export packing must be greatly improved. Aside from firms that specialize in certain lines and have studied carefully the requirements of foreign packing, American manufacturers, generally speaking, have improved very little in their methods during the past two or three years. This is probably due in some respects to the trying conditions caused by the war. One thing American exporters should bear in mind is that goods are probably handled more roughly on the West Coast of South America than anywhere else in the world, Some of the officials supervising the unloading of the ships, as well as most of the workmen, seem to take very little interest in the way cargoes are handled, and as a result there are endless breakages and consequently much loss from pilfering.

"The common criticisms of American packing are that the cases are too light, the lumber used is too brittle and splinters very easily, nails are not of sufficient length to hold securely, and there are usually no strap-girdles around boxes to keep them from bulging open or coming entirely apart. It has been suggested by the manager of the shipping department of one of the most important steamship lines that cases of goods to be shipped to the west coast countries of South America, should be tested to withstand a dead drop of at least ten feet before they are allowed to leave the packing rooms of the factory. While this seems to be a severe test, it is not nearly so severe as the treatment they are likely to receive before reaching their destination.

Courtesy of Peck & Hills.

PACKING OF FURNITURE.

The crate at left contains a dresser thickly padded with excelsior and burlap. Crate in center contains red chairs wrapped in kraft paper, with excelsior pads and braces across backs and under seats of chairs. Crate at right contains two upholstered chairs wrapped in kraft paper and bound with excelsior and burlap. Note use of bracing.

Courtesy of S. Karpen & Bros.

PACKING OF BED.

Seat of bed is placed in oil-paper lined crate. Layers of waterproof paper placed between each part.

Courtesy of S. Karpen & Bros.

BED BEING PLACED IN CRATE.

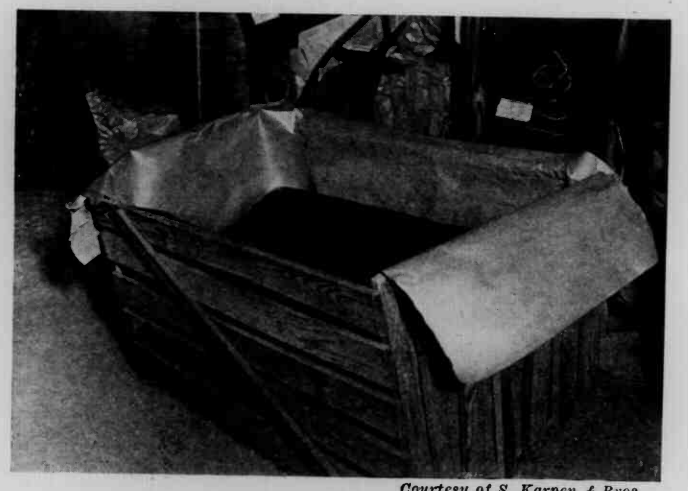
Back of bed placed in case on top of seat.

"Extra strong cases or crates must be used to withstand the numerous operations of handling. Damage often results during hoisting by tackles. The sides of cases sometimes collapse when the slings become taut, causing the tackle to give way and the package to fall a long distance into the hold of the vessel or onto the lighter, or not infrequently into the sea. The contents of a case should be securely fastened within to prevent moving about, and proper reënforcements of the weak parts of the exterior covering should be made.

"A proper method of marking a case should be used. The numbers of the cases, destination of the goods and name or mark of the importer should be stenciled on with good paint in figures and letters at least 2½" to 3" in height. There should be a discontinuance of the practice of covering boxes with English advertisements, which are generally burnt into the wood while the really important information is carelessly marked on with a brush and inferior ink—the letters being often so small as to be almost or completely obliterated before the case reaches its destination. This condition does not obtain in the case of goods from Europe; very little if any advertising is used, while the names, numbers and addresses are properly marked, easily read and withstand a great amount of rough handling. The matter of marking cases is something that American exporters should seriously consider in order to avoid trouble."

Manufacturing Furniture for Export.—Before any furniture can be properly packed for export, attention should have been paid to the manufacturing with this special end in view. Furniture must never be packed until the varnished surfaces are thoroughly dry and hard. Many complaints have been received of wrapping paper used to surround furniture surfaces and excelsior used for protection having stuck to varnish not thoroughly hard, with the result that when the articles arrived at points of destination they had to be scraped, re-varnished and re-finished before they were in salable or even usable condition.

INTENTIONAL SECOND EXPOSURE



Courtesy of S. Karpen & Bros.

PACKING OF BED.

Seat of bed is placed in oil-paper lined crate. Layers of waterproof paper placed between each part.

Courtesy of S. Karpen & Bros.

BED BEING PLACED IN CRATE.

Back of bed placed in case on top of seat.

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Several phases of the activities of the Forest Products Laboratory at Madison, Wisconsin, have a bearing on the problems of shipping furniture overseas. According to "Technical Notes," published by the Laboratory: "These cover the conditioning or preparation of the wood to suit the climate to which the furniture will be sent, the use of waterproof glues, kiln drying, boxing and crating for overseas shipments, and possible treatments to prevent depreciations of wood-destroying insects. While information is at hand on general principles, the application of these principles to the needs of the furniture industry has never been studied, and cannot be undertaken without the cooperation of manufacturers.

"In general, it can be stated that furniture manufactured in the north central states will check and open up when sent to desert regions, and that its wood will swell, the glue joints open up, and the veneering come off when it is sent to tropical, humid regions. Exact knowledge of the climatic conditions surrounding the use of the furniture at its destination, and a reproduction of these conditions in the factory through the control of humidity in work rooms, should offer the successful solution of this problem. This would be coupled with consideration of drying the lumber to the proper moisture content, and shipment in moisture-proof packages to insure delivery in good condition.

"Furniture as well as other wood products used in the tropics is subjected to the attack of insects known as termites. This attack is excessive in South America in the coastal regions north of Rio de Janeiro, and is so certain and so severe that, in the opinion of the Forest Products Laboratory, it is undesirable to export wooden furniture to those regions unless the wood used is naturally resistant to termites or is treated with a poison which will prevent the attack of these insects, such as mercuric chloride."

The Forest Products Laboratory has recently been conducting several courses for the benefit of manufacturers, dealing with kiln drying and the handling of glues

and ply-wood. Twenty-one different manufacturers sent representatives to the second course given in this line, and it is understood that similar courses are to be continued and elaborated.

Observations of Export Merchants.—Furniture is, of course, one of the most difficult products to pack properly, and several letters on this subject have been received from export merchants who have had experience in exporting this line. A New York export merchant dealing largely with the Levant calls attention to the fact that few iron bedsteads are shipped from the United States despite the fact that the English, notably the Birmingham manufacturers of such bedsteads, have a tremendous trade not only in the Levant but in all parts of the world. This merchant states that the difficulty with American metal bedsteads is not that prices are too high, or is not even essentially the fact that styles and methods of manufacture are somewhat different from the English, but the main objection to the use of American metal bedsteads lies in the packing for export to which American manufacturers have seemed to pay little attention. Ordinarily American goods in this line are shipped one bedstead in each case, which often measures in excess of 20 cubic feet. English and other European manufacturers wrap all the flat pieces with suitable paper. The side bars are laid flat, protected with straw rope and straw laid loose, and either bundled or crated, or several complete bedsteads are packed in a crate or case which when complete measures considerably less than a ton. The development of American exports in this line is believed by this merchant to depend chiefly, if not solely, on the improvement in our export packing to gain cubic space and bring the resulting delivery costs down to the level of similar goods of European competing manufacturers.

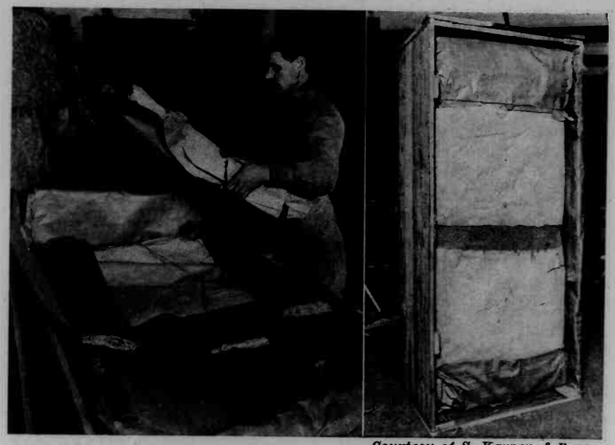
The same merchant writes in regard to the packing of knocked down furniture, that very frequently such shipments are not properly marked and arranged, containing no packing lists, which ought to be placed inside each case, and that the different pieces are not properly num-

bered so as to indicate the exact position which that piece is to occupy and facilitate the putting together of the entire article. It would be better to enclose a blue print or a photograph with each piece of knocked down furniture to show to the customers exactly how that piece of furniture appears when set up.

A prominent house exporting to South Africa states that the invariable rule ought to be that all furniture should be so packed that the cases or crates may be turned upside down and transported in any position. The great thing to guard against is the danger of varnished surfaces rubbing against the cases or crates. Another point made by this merchant is that knobs and handles, some decorative carvings, etc., are frequently broken off and keys are frequently missing. All handles, knobs and keys should be taken off and packed in a separate box securely tied to or preferably, in some manner, attached to some part of the piece of furniture where the separate box can readily be found.

Objection is also made to the way in which some American manufacturers ship bureaus and dressers and the mirrors which go with them. It appears that manufacturers more frequently than not simply cover the mirror with paper and crate it, with the natural consequence that a great many of them are broken on arrival. This export merchant advocates following the English practice of packing each mirror in a separate box thoroughly cushioned with excelsior, and enclosing that box, which in turn should be properly protected, inside the box containing the other pieces of the furniture in question. (See also explanation of "floating" in chapter on the packing of glass and fragile goods.) Attention is also directed to the fact that some kinds of furniture which permit of very close boxing, such, for example, as refrigerators, not infrequently suffer from careless nailing of the outside cases, the nails being driven into the furniture contents instead of into the inside ends or braces of the case where they properly belong.

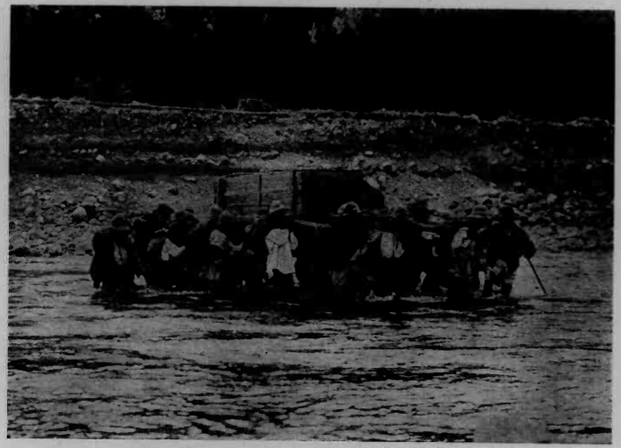
Another export merchant, dealing with certain trop-



Courtesy of S. Karpen & Bros.

PACKING OF BED AND BOX COUCH.

Illustration at left shows method of packing bed. Two ends are placed on top of back. Note excelsior pads which prevent rubbing of parts. Illustration at right shows box couch wrapped and firmly held case.



Courtesy of The Century Co.

TRANSPORTING PIANO IN SOUTH AMERICA.

Illustration shows that pianos do not always travel in vans and should be packed accordingly.

INTENTIONAL SECOND EXPOSURE

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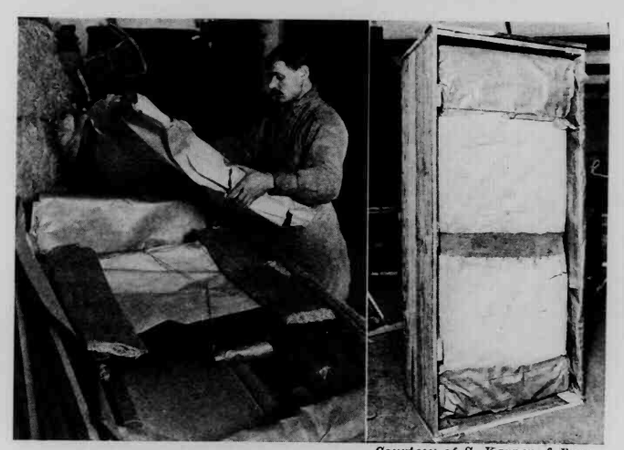

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Courtesy of Geo. Borgfeldt & Co.

CRATED FLOOR LAMP.

To fit lamp closely crate is tapered. Shades are packed separately.

Courtesy of Victor Talking Machine Co.

PACKING OF PHONOGRAPH RECORDS.

Photograph shows single record in envelope, corrugated board box containing 25 records, boxes placed in case and closed case. (Series 1.)

ical countries of South America, points out that the glue used in some American furniture is either not of the right quality or is improperly used, because sometimes pieces of furniture fall apart under the influence of the tropics. This merchant urges that furniture for the tropics should be fastened with screws, and if glue is ever used it should be supplementary to the screws and most carefully and scientifically employed.

Where lightness is desirable in shipments, as to certain countries where duties are assessed on the basis of gross weights, all furniture should, whenever possible, be shipped knocked down, thoroughly protected from the danger of abrasion by the use of thick beds of excelsior, then wrapped in burlap and finally very lightly but solidly crated. Extreme care should be exercised that no drops or other misusage of shipping packages can cause springing or breaking of the contents.

Reduction in Cubic Space Necessary.—One of the mistakes in export shipping to which furniture manufacturers seem particularly prone is the disregard of the widely known and constantly emphasized fact, that ocean freight rates on such comparatively light commodities as furniture are charged, not on the weight of the packages, but on their cubic measurement. The economizing of the cubic measurement of each case containing furniture, even if only by a few cubic inches, means a corresponding decrease in the cost of the goods to the foreign customer. Complaints are constantly being received from buyers of the disregard of specific and repeated packing instructions given to manufacturers, which have entailed the loss of a good deal of money because of the excessive freights paid on account of unnecessarily large packing or the neglect to include small packages in the otherwise vacant spaces in larger cases. An example is given of a shipment to the Argentine Republic of sectional book cases, card index boxes, etc. These were all shipped separately, whereas the small card index boxes might easily have been packed in the empty spaces inside the bases of the sectional book cases. A good many cubic

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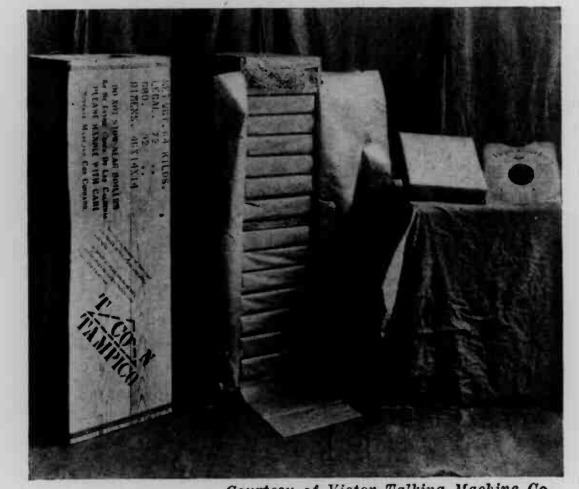

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feet of space which had to be paid for at high freight rates were wasted in shipments of this description. In another case a manufacturer failed to nest metal cash boxes as he ought to have nested them, one within another. Each one was packed separately, and the resulting freight charges were two or three times what they ought to have been.

From many letters received from manufacturers of various kinds of furniture detailing their experiences, practices and policies in export shipping, the following excerpts may be chosen as likely to be of interest and value.

General Household Furniture.—One of the largest firms specializing in shipping furniture for export submits a number of photographs illustrating its practices in export packing which are reproduced on pages 480 and 491, and writes in this connection: "This company makes its own cases and crates for export shipments. These are built of one-inch lumber, usually of North Carolina pine, but birch or gumwood is sometimes used. Lumber is dressed on both sides so that it is about 7/8" after planing. Both cases and crates are lock-cornered—that is, they are so built that all the nails go into the edges of the boards instead of some going into the ends of the boards. In this way boards are prevented from splitting or working loose, and the cleating used by some companies to accomplish the same end is made unnecessary. Coated nails are used throughout, as these do not easily pull out. Cases are strapped all around the edges with 3/4" straps of high-grade metal.

"When furniture is packed in cases a bed of picked excelsior about one inch or more thick, placed between layers of kraft paper, is put into the case on at least two sides. When needed, as in cases of bedroom, dining room, living room, or office furniture, braces of wood about an inch thick are nailed to the case across the bottom of the article that is being packed, and also across the front in order to hold it firmly against the padding of excelsior at the back and top. Two braces are usually used across

the front, one across the bottom, and other braces may be used where needed, according to the nature of the shipment. Often the ends of the braces are screwed into the sides of the case, and nailed to cleats above and below to prevent splitting. The general purpose of bracing is to keep the article from shifting, hold it firmly against the resilient bed of excelsior, and protect it from breakage by lifting it away from the sides of the case, so that even if the case should be injured the furniture may still be safe.

"All cases are lined with kraft or oiled paper or tarpaulin, depending upon the country to which they are going. If goods are to go by muleback at the last stage of the journey, waterproof paper or tarpaulin is used, so that they may be removed from the case before loading onto the animal's back and still be protected from injury by rain or other causes.

"If furniture is packed tight enough in a case or crate it is not necessary to use braces, but braces are always used unless the goods fit perfectly. The lumber used in all of the packages shown in the accompanying photographs is 4/4 North Carolina pine, birch or gumwood. Crates as well as cases are always iron strapped with bands of from 3/4" to 1" wide, nailed with cement-coated nails. The only exception to this rule with us is in a few shipments to the West Indies where it is believed iron strapping is not required."

Another large shipper of furniture gives the following details referring to his export packing. "Furniture should be knocked down as much as possible before packing. Then it is wrapped, usually in heavy wrapping paper, and excelsior pads are placed here and there around the edges, if necessary, to prevent rubbing. The furniture is then boxed, preferably in a strong case which has battens all around the edges. If the furniture is irregular in shape, braces are used, that is, strips of wood three inches or so wide are nailed across and close above parts of the furniture from one side of the case to the other, in order to keep the article from shifting. For

example, a divan might have a brace across the seat and another across the back. By careful bracing it is sometimes possible to pack more than one article in the same case.

"Cases should be used where goods are going a long distance, and as an extra precaution, oiled paper lining is sometimes used inside to prevent moisture from penetrating. The ordinary casing is made of lumber 1" frame and ⅞" filling. The wood is planed on both sides—the inside so that it will not scratch the furniture, the outside because it makes a smoother surface for marking. The cases should be strapped with iron strapping from ½" to 1" wide, according to the size of the case. These straps are nailed all around the edges of the case. When furniture is shipped overland by muleback it may be packed either in bales or cases, depending on whether duty is paid by gross weight or not. It is also sometimes necessary to use tarpaulin in order to protect the goods from rain storms. Sometimes oiled paper is used inside instead of, or in addition to, the tarpaulin.

"When furniture contains glass, special care is, of course, necessary. As a rule, glass should have two strips of paper in the form of an X pasted from corner to corner. When glass is packed separately, the best method is as follows: If more than one layer of glass is to go in the case, paper is laid between them, and excelsior is stuffed between the glass and the sides of the case. This case is then put inside another case, which is filled with excelsior. (See chapter on the packing of glass.)

"To nearby countries crates are frequently used instead of cases. The crates are made of lumber with 1" frame and ½" to ¾" filling, the boards of the crating being from four to six inches apart. The furniture is braced, just as when packed in cases, and the crates should be iron strapped in the same way. Wicker furniture, being less breakable than other kinds, is generally packed in crates, unless it can be completely knocked down, in which case the parts may be baled or boxed.

"Baling is done with burlap and excelsior, the burlap

Courtesy of Victor Talking Machine Co.

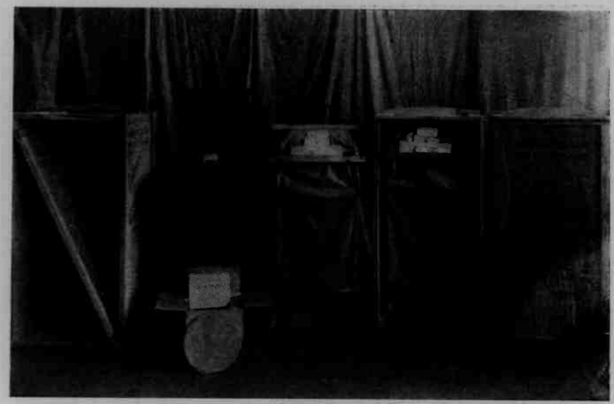
METHOD OF PACKING SMALL PHONOGRAPHS.

Victrola and outfit box are wrapped together in paper and tied. Layer of four machines placed in case tightly embedded in excelsior. Note additional batten placed around the middle of closed case. (Series 2.)

Courtesy of Victor Talking Machine Co.

MEDIUM SIZED PHONOGRAPH PLACED IN CASE.

Needle box, sample needles and sound box tacked to motor board, turn tables and winding key separately wrapped. The victrola in waxed paper tightly embedded in case with excelsior. Packing case firmly strapped. (Series 3.)



Courtesy of Victor Talking Machine Co.

PACKING OF LARGE TYPE PHONOGRAPH.

Instrument after locking and wrapping of taper tube is placed on skid. Note that cleats do not rest on machine owing to use of corks. Machine is firmly held in case by screws driven through the sides into skids. (Series 4.)

Courtesy of Remington Typewriter Co.

METHOD OF PACKING TYPEWRITER.

Machine is firmly attached to case cover by means of a cradle and is placed in case upside down. Empty cradle shown. Note that lettering on case is inverted, in packing; the case is turned bottom side up and typewriter cradle attached to bottom cover of case.

being laid out, spread with excelsior to a depth of five or six inches or more, according to the article that is to be packed, then brought up over the furniture and sewed tightly. Baling is advisable only for very nearby countries, or when the article can be completely knocked down or is so inexpensive that the price of casing would be disproportionate to its value, and where duties are paid by weight."

Packing of Office Furniture.—A large manufacturer of office furniture has developed what he believes is adequate and satisfactory export packing. This manufacturer writes: "When it is considered that merchandise that is destined for foreign lands undergoes in a great many instances the roughest possible handling, there should be no wonder that we give the matter of packing for export our very careful study.

"Both wood and steel cabinets as well as desks are first carefully wrapped in either oiled paper or kraft paper (an absolutely waterproof paper). Boxing is then prepared allowing a good distance all around the cabinet for packing with excelsior. The casing is then built up as rigid and strong as possible; the ends of each box are reinforced and all stock is $\frac{7}{8}$".

"On the average sized cases we use two iron bands, but when the boxes are extra large, three bands are used. These bands are the strongest protection we know of and are drawn up exceptionally tight by means of clamps, both ends being held with automatic fasteners.

"The cases are very carefully marked with the net and gross weights on the outside, and in cases where goods are to be forwarded through New York forwarding houses, the foreign address is covered by a small board, which is lightly nailed to the case, and bears the address of the forwarder."

Another house doing a large business in furniture made of steel and wood sends drawings of its export packages (see page 509) and states that in the construction of its crates, "We use elm and hemlock lumber 1" and $1\frac{1}{4}$" thick fastened with 8-penny and 10-penny nails.

The cabinets are wrapped with double thickness of gray express paper before being put into the crates and padded with 6″ excelsior pads on corners and wherever necessary to prevent contact between crate and cabinet.

"In crating, a bottom frame is built and the cabinet is then placed on this frame; then the top frame is built and placed on top of the cabinet, resting on the excelsior pads mentioned above. The sides are then nailed on the crate, after which braces are put on, also 6″ metal boxing strips. The diagonal braces are used to prevent racking of the cabinet when it is handled by derricks or hoists in and out of the ship. This is practically unnecessary on anything but export shipments, as this method of handling is confined almost exclusively to export shipments."

A large shipper of office desks declares in a letter that the greatest requirement in export shipping is that boxes be rigid and not subject to distortion and consequent injury to the contents. "We reënforce top and bottom of our cases with two cross pieces and use tight boxes of 13/16″ chestnut matched lumber. We use sufficient quantities of paper and excelsior to keep all surfaces of the desks away from the boards of the cases. The great point, however, is that the cases be rigid."

Upholstered Furniture.—A prominent New York house which has shipped a great deal of expensive upholstered furniture to various export markets sends photographs, which are reproduced on pages 492 and 497, and a letter stating that packages are generally made up in accordance with customers' specifications. This house believes that, in general, a crate is as satisfactory for overseas shipments as a case, and its customers, many of whom are in South American countries, frequently specify crates in order to save weight. The wood used is 1″ pine. The crates are lined with oiled paper and layers of the same are placed between each part of each article. Heavy pads of excelsior are used between each part of each piece of furniture to prevent rubbing, and the pads are also used to protect against abrasion with outside case. A general idea of the packing supplied by this house will be further gathered from the photographs to which reference is made.

Export Packing of Pianos.—The man whose ideas of piano transportation are limited to the padded vans one sees in the city streets, and who has noted the extreme care with which these costly instruments are carried from van to house and finally placed in the music room or drawing room, need only look at the illustration on page 497, made from a photograph taken by Mr. Harry A. Franck[1], that accompanies this text, to realize that he has only seen part of the travels of the piano. This photograph is really a commentary on any export package and should be studied and remembered by anyone interested in the pilgrimage of foreign shipments.

The name of the factory manufacturing the piano illustrated by Mr. Franck we do not know, but we hope that this factory had some idea of transportation in South America and of the severity of the mountain voyage of a once sweet-toned instrument. For, if the factory did not know and if it packed this piano without knowledge of the elements entering into the problem, it requires no imagination to picture the disappointment of the owner and his feeling toward American-made goods. The man who first of all makes a considerable expenditure for a piano, then performs the task of having it brought to some West Coast port, and then gets together the small army that is going to carry that piano into the fastnesses of the mountains, is thirsty for the delights of harmony, and if he does not get them, but in place receives a mass of swollen felts and rusted wires, his feelings are going to be quite intense.

The manufacture of the piano, like that of most musical instruments, has been brought to a state of excellence in the United States that permits world-wide competition with the instruments manufactured in Europe, and in the case of pianos one American manufacturer has the honor of having his instruments selected

[1] Reproduced from "Vagabonding Down the Andes," by permission of The Century Co.

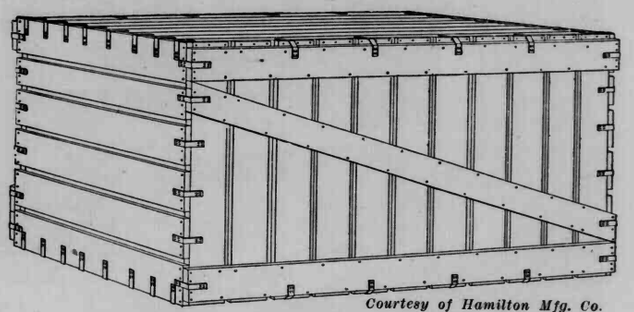
the world over for their excellence and high standard.

A well known manufacturer described verbally to the writer his method of export packing as follows: The export package does not differ from the domestic package except that the export package is tin lined and hermetically sealed. In both packages the piano rests on strips of wood which float it as if it were in the middle of the case, the piano being securely fastened to the wood strips. These strips in turn are wedged so that there is no possibility of their slipping, the whole making a rigid, solid export package.

A compartment is provided for the legs and lyre, and the piano is placed in the case or removed by lifting it in a horizontal position. The package is so designed as to provide a minimum of labor in unpacking. The manufacturer states that: "These packages have been successfully transported to all parts of the world and are the result of many years' careful study of the requirements of export."

Another manufacturer of pianos writes that his boxes are made of lumber 1" thick with three battens 4 inches wide carried around the entire box, the corners being fastened with iron angles. There are two additional 4"x1½" battens at each end on the back of the box which is iron-strapped all around. The interior packing involves the use of two padded strips, one at each end between the end of the piano and the box, and a padded stretcher running the entire length of the box against the side below the key-bed. This is fastened with a cleat. In addition there are two corner posts 2"x2" screwed through the end and front of the box and extending from the key-bottom downward to the bottom of the box.

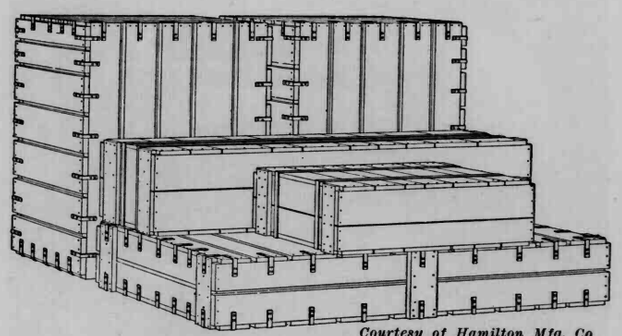
A third piano manufacturer sends a letter stating that the bottoms of his export cases are reënforced by skids running the full length; there are inside cleats and an extra cleat running around outside of the box in the middle. All cases are lined inside with waterproof paper and nailed with 10-penny cement-coated nails. Instead of four lag screws usually employed, one in each



Courtesy of Hamilton Mfg. Co.

CRATE FOR PRINTER'S IMPOSING TABLE.

Notice solid construction of crate and diagonal bracing.



Courtesy of Hamilton Mfg. Co.

CRATE FOR PRINTER'S CABINETS.

Cabinets are wrapped with double thickness of paper and padded with 6" excelsior pads.

Courtesy of National Cash Register Co.

PACKING OF CASH REGISTER.

Machine and accessories ready to be placed in case.

Courtesy of National Cash Register Co.

METHOD OF FASTENING CASH REGISTER IN CASE.

Machine is covered with waterproof cloth. Braces are placed to remove pressure from front of case.

corner, this manufacturer uses eight screws 4½"x⅜", two in each corner, passing through the back of the box into the back of the piano.

It is to be noted in this connection that foreign importers of American pianos have sometimes complained that as cases containing pianos, as well as other commodities, are often turned upside down in handling, if only two lag screw bolts are used the pianos frequently break away and are seriously damaged. The greatest possible care ought to be taken in securing and in otherwise thoroughly bracing pianos within export boxes.

Packing of Billiard Tables.—A large company manufacturing billiard tables which has exported its products for many years writes in regard to its export packing as follows: "The bed of every billiard table consists of three slabs of slate of equal size usually from 1" to 1½" thick. We pack these slabs of slate two in one case and one in another, unless they are thicker than 1½" and then each slab is placed in a separate case. Three inches of excelsior are laid on the bottom of the case, on top of that the slate, followed by three inches more of excelsior on top. When two slate slabs are packed in one case they are laid face to face on top of each other. Three inches of excelsior are also stuffed between the edges of the slabs and the sides of the box so that they are thoroughly protected all around. We use extra heavy cases of 2" lumber screwed together. In addition to the two cases in which the slate bed is packed, two more cases are required for each billiard table. The tables are shipped knocked down, one case containing the two ends, each with two legs attached. The two ends are placed on top of each other with the two pairs of legs in opposite directions, forming a hollow square which fits tight into the case; the second case contains the broad-rails, cushion rails, cues and remainder of the equipment."

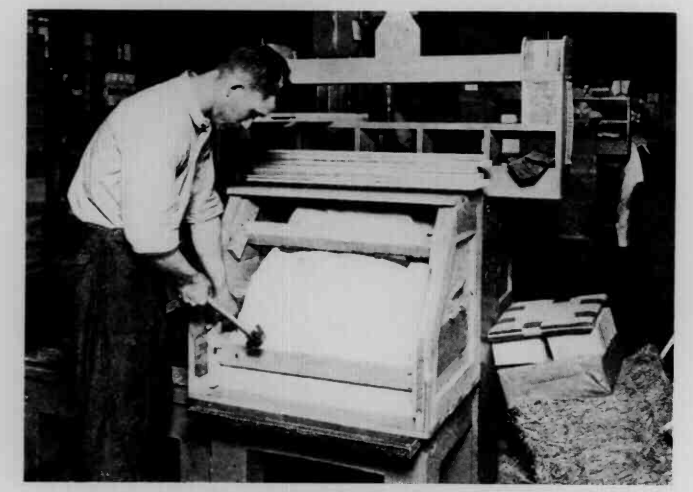
Floor Lamps.—A large New York exporter of novelties and specialties sends the excellent photograph (see page 498) illustrating packing of a floor lamp about six feet in height. It is to be noted that the lamp is

INTENTIONAL SECOND EXPOSURE

Courtesy of National Cash Register Co.

PACKING OF CASH REGISTER.

Machine and accessories ready to be placed in case.



Courtesy of National Cash Register Co.

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Floor Lamps.—A large New York exporter of novelties and specialties sends the excellent photograph (see page 498) illustrating packing of a floor lamp about six feet in height. It is to be noted that the lamp is

padded with excelsior and paper and that a closely fitting crate tapering at the top is made especially to fit it. If more than one lamp is to be forwarded in a single shipment, from two to four may be packed in a crate, alternate lamps being packed reversed, the top of one tied to the foot of its neighbor. The lamp shades are packed separately in cardboard boxes suitably crated.

Talking Machines.—Among the American industries that have made unusual progress in export the talking machine manufacturers are notable, for throughout the world the excellence of the American made machine is recognized and this, together with the unusual repertoire offered, places the product in a distinguished position.

The packing of this instrument offers a number of angles that are also characteristic of other lines described in this book. We have first the necessity of protecting the fine cabinetwork of the talking machine for, with machines valued at times at several hundred dollars each, it is paramount that the merchandise be received without blemish, and in addition to the usual requirements of careful protection from friction and abrasion we have the necessity for complete protection against moisture.

In describing its export packing a company doing a large international business submits a number of highly interesting photographs, shown on pages 498, 503 and 504, with captions briefly describing each style of packing which may be more adequately explained as follows: In Series No. 1 the corrugated board boxes each containing 25 records are wrapped in kraft paper and finally in waxed paper, the flaps sealed with sealing tape, making each package practically moisture proof. The packing case itself is lined with a waxed paper, divided near the center with a wood head nailed through the side of the box; in each end of the case are placed several pieces of corrugated board and any empty space remaining, because of the varying thickness of different records, which makes it impossible to supply cases which will exactly fit, is filled with a second inside wood head and excelsior stuffing. The case itself is made of ¾″ yellow pine lumber tongued and grooved, the ends fully battened with ¾″x2½″ strips and the case is iron strapped all around.

In the illustration of packing Series No. 2, it is to be noted that above the first layer of machines are cleats to hold the instruments solidly. This case is made of the same size lumber as that just previously described, but it is to be noted that there is an additional batten around the middle of the case to prevent spreading. In packing Series No. 3, a case with sides, bottom and top of ⅝″, yellow pine tongued and grooved is employed, the ends being made of ¾″ yellow pine fully battened with ¾″x2½″ strips.

Packing Series No. 4 presents several very interesting features which are deserving of notice by exporters of all kinds of furniture. It will be noted that the motor, turn-table, etc., of this machine are packed in a separate corrugated board box which is placed in the open space underneath the machine between the legs. It is then to be noted that the instrument itself is mounted on a substantial skid to prevent the legs touching the bottom of the case. Cleats are used which completely surround the machine at the top but are prevented from touching the machine by corks inserted in the cleats. These corks are coated with paraffin to prevent damage to the finish of the machine by rubbing and friction. The lid is held tightly in place by two clamps fastened to the guard rails surrounding the top of the instrument, and the whole upper cleated structure is fastened to the skid on which the machine rests by means of two strips down the sides. It should be observed that none of this cleating actually touches the finish of the machine. It is used to prevent the instrument coming in contact with the packing case. The latter is built of five-ply veneer with a total thickness of approximately ½″, making it to all intents and purposes puncture proof. The resulting box is fully battened with ⅞″x2″ strips. On the top of the case a triangular piece of lumber is nailed and strapped on in the effort to prevent the turning upside down of the instrument. The machine is held firmly in place in the case by

means of screws driven through the sides of the box into the sides of the skid which supports the machine. The upper part of the cleated structure is not fastened to the packing case, thus allowing the instrument to move slightly and be relieved from much of the shock should the box be roughly handled.

Export Packing of Typewriters.—The typewriter is a peculiarly American invention and is one of that great category of labor-saving devices that characterize the development of American business. With a simple machine to merchandise and one with an enormous potential consumer demand throughout the entire world, the typewriter companies were early in the foreign field, and several of them have developed an export package of excellent value from the standpoint of portability and security.

We illustrate this chapter with a photograph (see page 504) of the export package of a well known company and it is to be noted that in this case the typewriter is attached to the bottom of the case. When the box is upright the typewriter is resting on the floor of the case, and this method of packing also greatly facilitates the opening of the case and the removal of the machine. Describing this package, our correspondent writes us: "Typewriters for export shipment are packed in strong wooden boxes. These boxes are made of ¾" material and the four sides are mortised together. Grooves are cut in two opposite sides of the box providing a hold by means of which the box is readily handled. In the case of Russian shipments, however, rope handles are also provided on two opposite sides of the box. The cover of the box is provided on the outside with two hardwood strips 2"x⅜", to which the machine is securely fastened. Two other hardwood strips 1"x⅜" are placed across the top near the sides to further strengthen it.

"When the machine is received in the packing department, all nickel plated parts and others not protected by a rust proof finish are given a coat of grease to prevent rusting. All moving parts are then tied securely in place by means of ½" white tape. Twelve such ties are made.

Courtesy of National Cash Register Co.

FINAL PACKING OF CASH REGISTER.

Open space filled with excelsior; top is fastened by means of screws.

Courtesy of National Cash Register Co.

COMPLETED CASE CONTAINING CASH REGISTER.

Note iron straps placed on bottom and rear of case.

INTENTIONAL SECOND EXPOSURE

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Courtesy of National Cash Register Co.

COMPLETED CASE CONTAINING CASH REGISTER.
Note iron straps placed on bottom and rear of case.

CASH REGISTER BEING MARKED FOR SHIPMENT. *Courtesy of National Cash Register Co.*

Photograph of shipping department shows machines on carrier. Each man stencils one set of marks, thus obtaining greater speed.

A cardboard type bar retainer, oiled to prevent rust, is then forced in position to hold the bars in place. A box cover is then obtained by the packer and turned upside down on his bench. This cover has previously had attached to it, by bolts and washers through the hardwood strips, two springs made of 1½″ wide steel and about ⅛″ thick. These springs are 13″ wide. A base board of hardwood is placed in position on these springs and the typewriter with wooden feet inserted is placed in position on the base board. Holes are provided in the base board into which the feet fit. A wooden saddle or packing piece, cut to the proper shape, is next placed across the front and one across the back of the top plate. The wood packing piece across the front is prevented from marring the enamel by means of 'packing buttons.' These buttons are a concave piece of metal, circular in shape, and are provided with a small key or feather which projects from the convex side. This key fits into the slot of the top plate screw and holds the wood away from contact with the enamel. The rear packing piece is prevented from marring the enamel by means of small pieces of felt placed between the wood and the top plate. These packing pieces are tied to the spring beneath the base board by means of a steel tie rod at each end. These are tightened up by means of a nut. The front and rear saddles are tied together by means of a metal strip at each side of the typewriter. Thus we see that the machine is now securely fastened to the springs attached to the under side of the box cover.

"The whole machine is now completely wrapped in a heavy oiled paper. Over this paper is placed the metal cover for the typewriter and this is fastened in place on the base board of the machine. On the inside of the box are fastened by means of white tape, the accessory box, ribbon and instructions. The box cover is next inverted over the box and dropped into place, thus placing the machine inside of the box. The cover is fastened in place with screw nails so that it may readily be removed with the aid of a screw driver."

INTENTIONAL SECOND EXPOSURE

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Packing of Cash Registers.—Cash registers may be fairly classed among that very unique group of export goods known as "American specialties." This class of commodities frequently enjoys a world-wide market and they are recognized everywhere as a product essentially of American genius and enterprise. Certain of these lines, like the cash register, are inventions of relatively very recent date and yet the development of the machine itself and the development of the world market have been little short of phenomenal. At first the cash register was a simple piece of mechanism and it was designed to serve a single purpose, but the latest machines are capable of most complex operations in bookkeeping and accounting.

American specialties have consistently sought the foreign market, and in the case of the best known manufacturer of cash registers the normal export shipments amount to more than 60,000 machines a year and the foreign business is taken care of by an army of salesmen and agencies. The story that could be written of these specialties would make a most interesting account of export expansion, and indicates what the right sort of effort can do when backed by the proper merchandise and selling ability.

The illustrations on pages 510, 515 and 516 have been supplied by a well known manufacturer and deserve study with their explanatory captions. It may be noted that the packing cases employed are made of 1" maple and are supplied to the packing department complete with cleats and braces in position. The machine is protected with waterproof cloth and the base covered with heavy cardboard; open spaces are filled with excelsior. The lids are screwed on, greatly facilitating the removal of machines from cases and leaving cases intact so that customers may use them for other purposes if desired. Attention should be drawn to the iron straps on bottom and rear of case. These are the points toward which the weight is thrown and are therefore strapped. This company does not regard straps as necessary on other parts of the case.

CHAPTER XIX

PACKING OF TINNED GOODS

THEORETICALLY the packing of fluids in cans would seem to be an ideal condition with which to deal, for here we have containers of a shape that admits of standard cases and the containers themselves are far from fragile. However, the packing of goods of this sort, to obtain the best results, is by no means simple, and, like every other problem of export packing, the work requires study and experimentation.

A good many things may happen to canned goods that are not well packed and protected. Poorly nailed cases mean punctured containers, weak crates or boxes mean as a rule that the customer is not going to receive his goods, and it is astonishing what can happen to a case of canned goods when the cans are not protected against crushing strains that may in turn be due to a variety of causes.

Commodities packed in tins are almost innumerable in variety, including not only liquids and pastes, but also powders and solids. Commonest among such shipments are to be noted paints, tinned fruits and vegetables, fish and meats, biscuit, pharmaceutical products, oils, etc. It is found necessary to pack many commodities in tins for export purposes, when pasteboard or wood cartons are ample for domestic shipment. This occurs both because of additional protection required for such commodities in transport overseas, and because of the perishable nature of some commodities in more trying climates than our own. Cereals and biscuit must be packed in tin to prevent spoiling by tropical moisture, and to guard against the entrance of worms and weevils. If these commodities, dried fruit, or other provisions of a perishable nature, are not packed in tin, they rapidly become rancid,

decayed or moldy in many countries to which they are shipped; they may be affected by long salt water voyages or by the long dry or wet seasons which prevail in tropical and semi-tropical countries, ranging from Central and South America to India, Africa and Southern China.

One feature of the export packing of tinned goods which should receive more adequate attention than heretofore has been the case, is the waste of space, or excessive sizes of packages, and consequent heavy freight charges, involved in the shipment of round tins when square tins holding the same quantities might be packed; square tins mean reduction of cubic measurements and consequently smaller export packages. This point is brought out in a letter from a large export house shipping chiefly to Japan, which points to the considerable loss of money which has occurred during the last three or four years when freight rates have ruled exorbitantly high as compared with rates before the war. Square containers, this firm believes, are far more satisfactory than are round tins, although comparatively few manufacturers or shippers appear as yet to have recognized their important advantages. It would seem that there need be no insuperable obstacles in the way of any large manufacturer securing square tins at comparatively economical costs, and any shipper doing a large volume of export business might rapidly forge to the front, as a leading supplier of his particular merchandise, through the very large economies he would be able to show to his customers in other parts of the world by reducing the cubic measurements of his export cases.

In connection with the subject matter of this chapter, the following specifications, issued by the General Engineer Depot of the United States Army, may be noted: "When tin containers for oils, paints and liquids are used they shall be of heavy sheets, well made, rectangular in shape, hermetically sealed, and securely packed in boxes or crates, with wood partitions between the containers. Containers will not exceed 5 gallons in capacity. Pack two 5-gallon containers in one box or crate."

Export Packing of Paints.—American manufacturers of paints were careful during the war to take advantage, so far as their national obligation permitted, of the export opportunity offered them, and it is believed that much of the gain made is going to be held. Several concerns will not lose their foreign trade if care and careful planning can preserve it, and these concerns, without exception, are making sure that their goods arrive in satisfactory shape at destination.

A well-known manufacturing concern which has shipped its products overseas for many years past sends several photographs (shown on pages 523, 524), and comments on its policy and practice in packing for export as follows: "Paint is packed in cylindrical tin cans. Gallons and half-gallons are packed in ream-top cans, which are sealed thus: a thin, round piece of tin is laid over the top of the can, the edge of the tin projecting about ¼" beyond the edge of the can. The can is then spun rapidly around by means of a machine with wheels, which press against the projecting edge of tin, turning the edge over on itself twice in a double seam, and jamming it tight against the can. The speed with which the can is spun makes the paint whirl up to the top, where it sticks to the side of the can, making the cover air-tight. This process requires great care, for if the can is not spun fast enough, the paint will not rise to the top, while if it is spun too fast, the paint will spill. A friction-top can, in which quarts, pints and half-pints are packed, has a plug-like cover, which sets down tightly into the top of the can. This kind of top is used for small cans because it can be pried off and is therefore uninjured by opening, making it possible to keep the can covered as long as the paint lasts. The ream-top can, however, cannot be opened except by cutting, and is therefore used only for the larger tins, which are bought by people who use a great deal of paint in such a short time that it has no chance to skin over.

"Pictures B and C show paint in cases. In each picture the case at the left contains 6 one-gallon cans; the

one in the middle contains 12 half-gallons (packed in two layers); the one at the right contains 24 quarter-gallons (packed in two layers). Notice that each of these cases contains 6 gallons of paint, although the size of the can varies in each instance. Five-gallon cans of paint are, however, usually packed one in a case because paint is so heavy. The purpose of the packers is not to have more than 100 pounds weight in any case, especially for shipments to South America, where the last stage of the journey is usually by muleback. Occasionally, however, as much as 50 gallons of paint are packed together; in such cases—usually for mining companies or other large customers—a barrel is used.

"Cans are prevented from rubbing against each other by means of wooden partitions between rows, but no wood is laid between the layers. To fill up the spaces, sawdust is shaken into the case. In one respect, picture C is misleading: crates are never used for packing paint; those shown in the picture contain empty cans as they are sent to the factory for filling. The lettering on the ends of the cases is burned into the wood. Firm and brand names are put on in this way, but the number referring to color and the statement of quantity (as '2—5 gln's cans'—see picture A) also gross and net weights in pounds and kilos, are stenciled. Cases are strapped with iron two or three inches from each end, and the straps are fastened with a small piece of metal by means of a machine which clinches it so tightly that it cuts into the wood, thus preventing slipping.

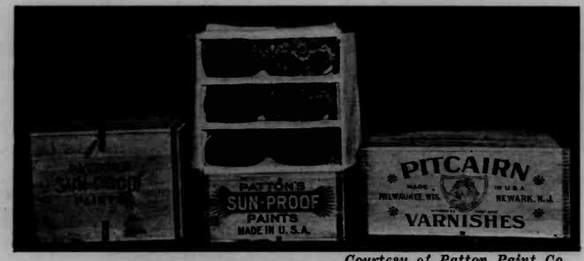
"Varnish is packed in oblong cans. Cases contain cans varying from the five-gallon size to a quarter-pint. As varnish is much lighter than paint, 2 five-gallon cans are often packed in a single case, as in picture A. The solid-top cans are always used, but instead of cutting open the entire top, a small nozzle is attached so that the varnish can be poured easily, and this nozzle is provided with a ream-top cap."

Another prominent manufacturer and exporter of paints supplies a photograph of his export packing

Courtesy of Devoe & Raynolds Co., Inc.

(B) Cases Containing Paint.

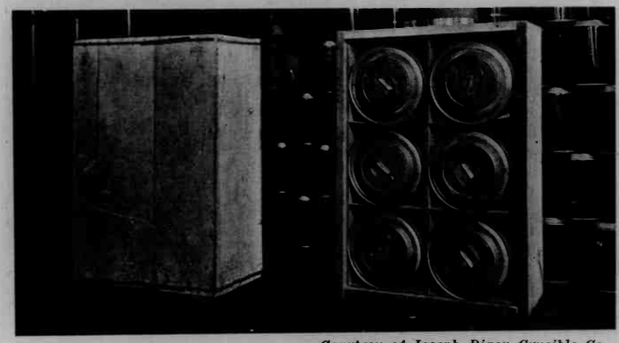
Each case contains six gallons of paint. Case at left has 6 one gallon cans; case in middle, 12 one-half gallon cans packed in two layers; case at right, 24 one-quarter gallon cans in two layers. Note wooden partitions between rows. No wood is used between layers.



Courtesy of Patton Paint Co.

Packing of Paints and Varnishes.

The lower center case contains 6 one gallon tins of liquid paint. Cans in upper center case are oval, a type peculiar to this brand. Case at left contains 2 five gallon square cans fitting snugly, and making cleats or sawdust packing unnecessary. Case at right contains 12 one gallon cans fitting snugly.



Courtesy of Joseph Dixon Crucible Co.

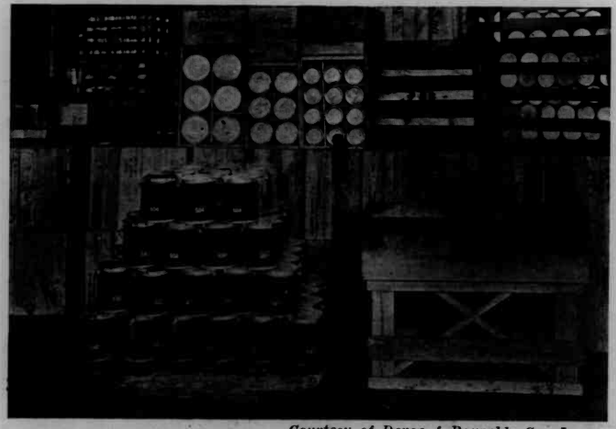
Packing of Graphite Grease.

Case of 6 ten pound cans of graphite grease packed in double-faced pasteboard cartons. Spaces between cans and cartons are filled with excelsior for export shipments. Cases are iron-strapped.

Courtesy of Devoe & Raynolds Co., Inc.

(A) CASES CONTAINING VARNISH.

Photograph shows cases containing two five gallon cans of varnish.



Courtesy of Devoe & Raynolds Co., Inc.

(C) METHOD OF PACKING PAINT.

Wooden partitions are placed between rows of cans to prevent rubbing. Sawdust is shaken in the case to fill up space.

(reproduced on page 523), and writes: "Sawdust is packed around the tins when our customers desire. Many of them, however, do not care for the sawdust, as they say it sometimes mars the appearance of the labels, and they agree with us that it does not add to the strength of the packing. However, in a case of paints it is impossible to entirely eliminate an occasional leaker, and in such cases the sawdust absorbs the leaking paint, thereby preventing it from smearing up the other cans in the case and running down onto the other cases in the shipment. The cans in the upper center case you will note are oval. We discontinued this type of cans as a war economy measure. The cases both right and left of the cut contain square tins fitting snugly in boxes so that no packing whatever is required. In the other case the tins are of the double-tight compression-top type, fitted in boxes made of white pine, ends of 7/8" material, sides of 5/8"; cross-pieces of 3/4" stuff form 6 compartments, holding the cans in place, the top of the case fitting tightly against another. Cases are strapped with half-inch iron bands at each end."

A large house specializing in graphite products submits photographs (see pages 523, 541) of its packing of graphite paints and greases in cans, one photograph showing six one-gallon cans packed in excelsior, another showing 6 ten-gallon cans of grease packed in double-faced pasteboard cartons. This photograph was taken before the interstices had been packed with excelsior, as is always done in export, but not in domestic shipments. All cases are thoroughly protected by strong iron strapping.

Packing of Oils.—A large shipper states: "Our cans are manufactured by ourselves and made from the best quality tin plate available. For the one-gallon size and under we use I. C. plate weighing approximately 107 pounds to the base box, and I. X. material for containers over one gallon capacity, having a weight of 135 pounds to the base box. Our can factory is equipped with the

most modern machinery and is managed by thoroughly competent and experienced help. In the manufacture of all cans we use the best quality solder that can be procured for seaming the sides, tops and bottoms. Every can is tested carefully by air pressure to determine leaks before the tins are filled. After the cans are filled and sealed, they receive a further test for the purpose of detecting leakers before they are packed in cases.

"Cases are set up in our case factory by modern machines. The best grade of white pine lumber is used for making the shooks, which are of one piece, sides, tops and bottoms, and free from knots and other imperfections which would tend to weaken the case or detract from its appearance. We handle only nailed cases, our experience being that these are much stronger than packages with lock corners. The thicknesses of the shooks are ½" sides, tops and bottoms, and ⅞" ends. On export business we furnish practically only two sizes, namely, cases containing 2 five-gallon and 6 one-gallon cans. Cases are shipped iron-strapped when consigned to certain countries—for example, the Far East, South America, and so on. For Great Britain and certain other countries, on the contrary, we do not consider iron strapping necessary.

"After the filled cans have been tested, they are packed carefully in cases, the covers of which are nailed on by hand. The packages are placed on a conveyer and put in storage. They are delivered from storage direct to the inside of the car or to the car door by means of a gravity conveyer. They are removed from the conveyer by hand and stored carefully in the cars. Plenty of dunnage wood of the best grade is used for blocking packages to prevent their shifting while in transit, so as to insure their arrival in good condition at the seaboard. These packages receive another careful inspection at the steamer's side by our own experienced coopers, so that when they are delivered aboard ship we have every assurance that we have done everything in our power to safeguard against defective cases reaching our foreign trade."

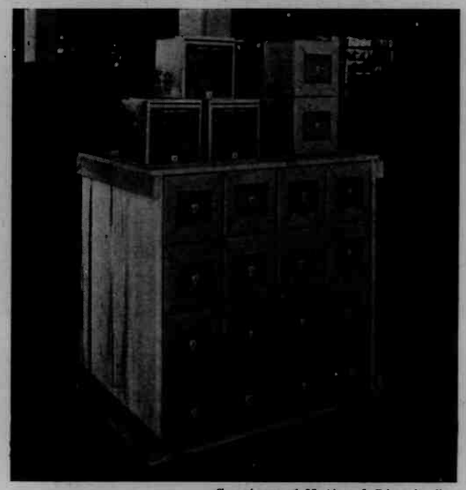
Kerosene oil, in cases almost invariably containing two tins of 5 gallons each, has been shipped for so many years to all parts of the world by large and experienced companies who have specialized in such shipping, that no description seems necessary in that connection. However, it has been pointed out that no little complaint has been received from many foreign markets of punctured tins and consequent loss of contents. This damage seems usually to have resulted from careless nailing of cases, although in some of the smaller markets to which case oil is shipped in small quantities, not in cargo lots, complaint is made of the perforation of outer cases as well as inner tins on account of superimposed packages of heavy weight or irregular shapes.

Packing of Tinned Fruits, Fish, Etc.—It is perhaps in the packing of tinned fruits, vegetables, some meat products, fish, and similar commodities, that remarks earlier in this chapter, relating to the advantages to be derived from the use of square instead of round tins, are particularly to be noted. While many paint manufacturers, for example, have utilized the square tin, exporters of tinned fruits, vegetables, salmon, lobster, and the like, seem not yet fully conscious of the distinction which exists between domestic and export shipping, in the sense that cases for steamship transportation overseas are charged freight not on the basis of the weight of the case, but on its cubic measurement, and that every inch saved in a cubic volume occupied by a case means a corresponding saving to the consignee in the cost of goods.

Another most important consideration, in connection with export shipments of such commodities, is the emphatic necessity of protection against pilfering. Meats, fruits, vegetables, are peculiarly attractive to the petty thief, as are chocolates and confectionery, and in many instances foreign customers of American houses have complained of losses of as high as 50 per cent in their shipments. In this connection, reference should be made to the chapter dealing with protection against pilfering.

As almost all such products bear attractive labels, and are intended for shelf display in retail shops, the preservation of the labels and the maintenance of an attractive package are peculiarly desirable and necessary. A merchant in Hong Kong, writing that he imports large quantities of canned fruits, suggests packing the interstices between the tins with light sawdust, so that if one tin becomes "bilged" from one cause or another, the sawdust would soak up the moisture and prevent it from affecting the remainder. (In this regard see former remarks as to similar packing for paints.) The same merchant also suggested that it would be desirable to mark the cases containing perishable goods with the legend, "Stow Away From Boiler." In this regard, however, it is to be noted that such a legend in the English language will be only understood on vessels and in ports where English is spoken, and furthermore that it is an unfortunate fact that longshoremen pay very little attention to warnings of any description. The Hong Kong house just referred to also wrote: "We are of the opinion that if two light one-quarter inch battens were nailed along each side of the top of each case containing such goods, that it would afford a means of ventilation between cases while in transit, with considerable benefit;" in reference to which suggestion it is further to be observed that the cubic measurement of the cases would be just so much increased by the addition of the battens which are recommended. Whether resulting extra freight charges might be offset by the better condition in which goods of this sort would arrive at destination, is a question which would have to be answered by experience.

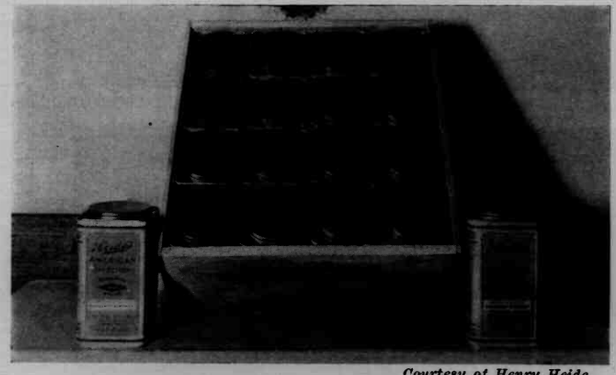
In regard to cases to be used for containing commodities of the sort now in question, the following has been extracted and abbreviated from a report made some time ago by a commercial agent visiting Porto Rico. He observed that in unloading canned salmon, about twenty cases (each of 60 pounds) were placed at one time in a rope net for hoisting from the ship's hold and swinging out over the dock. The goods, under the supervision of



Courtesy of National Biscuit Co.

(2) PACKING OF LARGE TINS OF BISCUITS

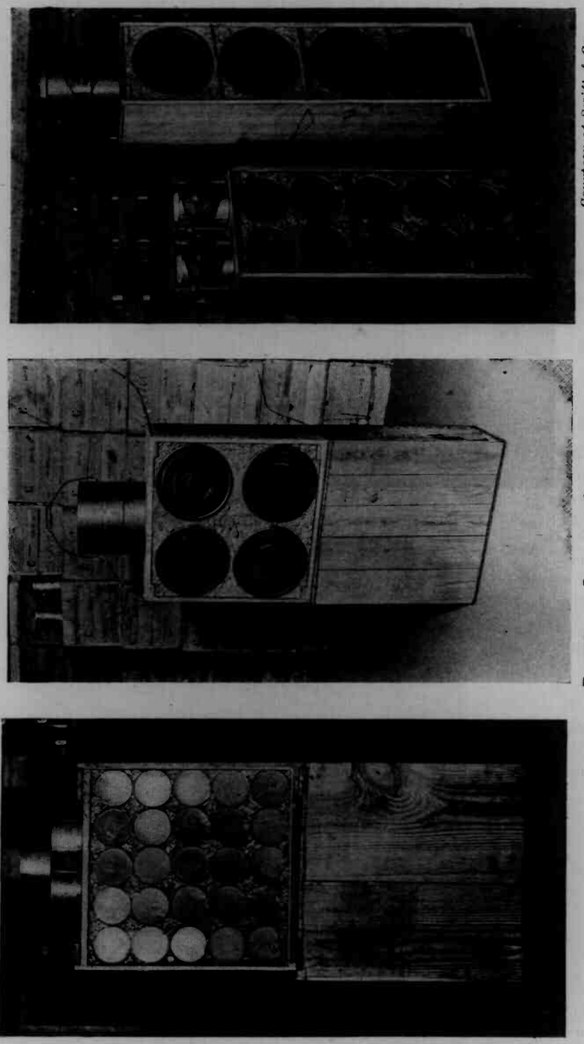
Large tins are wrapped separately to prevent rusting from contact with moisture. Each tin is labelled and has a strip at top of label identifying contents.



Courtesy of Henry Heide.

PACKING OF CONFECTIONERY.

Tin cans containing candies likely to be affected by dampness are packed in wooden cases with thirty 4 lb. or sixteen 7 lb. cans to the case. A thin cardboard is placed between cans to keep lithographed label from scratching. Cases are lined with heavy paper.



Courtesy of Swift & Co.

PACKING OF LARD AND OLEOMARGARINE.

(Left) Case is made of heavy pine, ends are reënforced so that if dropped the strain is equally distributed. (Center) Similar case containing four tins instead of twenty-five. In this case the corners are reënforced from the inside rather than from the outside. (Right) Single packing is used for export to countries where packages receive rough handling. Cases are iron strapped at ends and around middle.

the chief officer, were well handled, and no fault could be found with the method or care taken, yet in every net of cases three or four were broken, and the cans came out, running the risk of puncturing from nails or dents in the cases, and a few, of course, disappeared in the garments of the roustabouts. Cases in this shipment were made of good material, nailed with 1½″ smooth bright wire nails. Herein lay the fault. Such nails were driven through the tops and bottoms into the ends of the cases, entering with the grain of the wood, and were unable to stand the strain of 48 cans against either the top or the bottom. A four-penny cement-coated nail should have been used, with band iron, with which all such shipping cases ought always to be strapped for overseas transportation. This agent states that importers in Porto Rico are charged more for strapped cases than for those with iron bands, although increasing the cost of packages merely for strapping them must come from a lack of knowledge or consideration on the part of manufacturers. Just as heavy nails seem to be used for strapped as for unstrapped cases, and the saving through the use of lighter nails will offset the cost of the strap. Iron strapped cases require a much lighter nail than a case without straps.

A large American house specializing in shipping evaporated vegetables and fruits, states that it has found a very successful export packing of such commodities, sealed in tin cans, to consist of a light case with four or five wires, in place of the ordinary end strapping. This concern states that it has not yet received a single complaint regarding this style of packing.

Packing of Cereals.—A very large international shipper of cereals states that its products are often shipped in one-pound ten-ounce tin cans, 5¼″ high by 3½″ in diameter, hermetically sealed, packed 36 tins to a wooden case. The cases are made of hardwood lumber—sides, tops and bottoms ½″, ends ⅝″. Each end has two cleats, 2″x½″, running the full depth of the case, and every case is bound with nailed steel straps around each end.

Packing of Biscuits.—Humidity would be strictly a calamity as related to export shipments of crackers and biscuits, and so we see exporters of these products adopting every precaution to guard against this peril. Precautionary measures, however, do not mean alone protection of the goods, so far as the immediate container is concerned, but also imply suitable outer casing and rugged substantial packing as a whole. The author is indebted to a large exporter for the photographs of this chapter (see pages 529, 541), and for the following comment: "Goods exported by us to nearby and foreign lands, including the Near and Far East, are packed in hermetically sealed tins, and in addition we export our famous carton package goods, but only to such points where climatic conditions are favorable. The tins vary in size, containing from 2½ ounces to 10 and 12 pounds. They are sealed by means of an inner lid of tin soldered to a flange or rim which projects inside of the box from the top, thus preventing damage from moisture, insects, etc. A slip cover goes on over this, fitting tight around the edge of the box. The smaller tins, as shown in photograph No. 1 are wrapped together in heavy paper glued at both ends, in units of 6 or 12, according to the size of the tin. Each tin is encased with a photographic label showing a reproduction of the biscuit at both ends. The larger tins, shown in photograph No. 2, are wrapped separately, to prevent tin from getting wet and rusting. Each tin is labeled with the company label and an additional 'name strip' at the top of the label, to identify the contents. The case in the picture contains three layers of tins, 48 in all, each with net weight of four pounds. The size of the case is 19 cubic feet."

One of the complaints received from foreign customers in regard to American goods, relates to the fact that some American shippers of biscuit have not given sufficient attention to the size of the packages in which biscuits are packed. Boxes measuring inside from 2½″ to 3″ are made to hold biscuits only 2⅜″ in diameter, thus allowing a play to the contents which is quite likely

to damage a biscuit in a 10,000-mile journey. Since these unit packages may not be opened for months after they have been shipped, or even months after they have been received, the annoyance and ill feeling caused when the damage is discovered is so much the more intensified.

Confectionery.—An examination of the literature on the subject of American export trade in confections will show constant stressing of the importance of packing. The composition of American confections and the styles of sweetmeats seem to meet foreign demand satisfactorily, but there is apparently a good deal of dissatisfaction with reference to the way in which the goods are packed. It would seem that the American export trade in this class of goods could be very materially increased by proper attention to and consideration of the needs of the foreign buyer in the matter of packing.

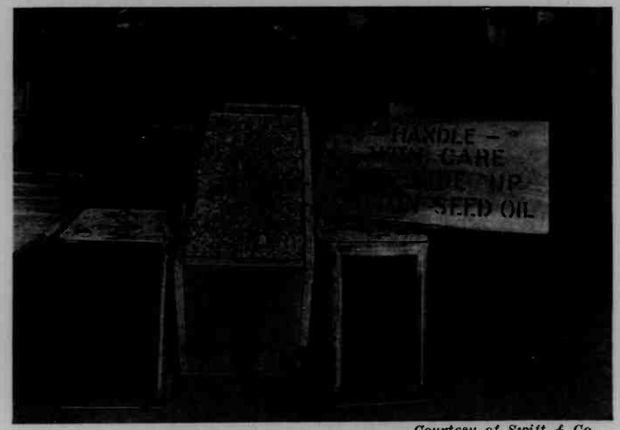
The author presents with this chapter two photographs (pages 448, 529) furnished by a house doing a constantly increasing trade abroad, the comment on these illustrations being as follows: "Candy for export to South America or other southern countries, is always packed either in glass jars or in tin cans to prevent spoiling by heat and moisture. The jars are used when the candy is intended for sale direct to the consumer, a jar or so at a time; they are hermetically sealed by a vacuum process, and will remain air-tight indefinitely, until opened, but not afterwards, as the cover has to be punctured in order to open. If the dealer wishes to sell in bulk, or if he lives in a particularly damp climate, his order is packed in tins with screw tops, so that he can sell a part of the contents and yet keep the remainder in good condition in the same container. Tin cans are packed in wooden cases, with 30 four-pound or 16 seven-pound cans to the case. Gross weight, with four-pound cans, about 175 pounds; measure, 4¾ cubic feet. Gross weight, with seven-pound cans, as shown in picture, about 145 pounds; measure, about 3 cubic feet. Certain kinds of candies, such as jelly beans, Jordan almonds, licorice lozenges, hard candies and other kinds which are affected

by dampness are always packed in tin. A thin cardboard is placed between cans to keep the lithographed label from scratching. Cases are lined with heavy paper. The case is covered and strapped in the same way as for the above. Address, etc., is put on by means of a machine-cut stencil." (See also cut page 448, Chapter XVI.)

Some exporters of confectionery, doing a large business with China, advise the present writer that all candy shipped to that market is first wrapped in oil paper, and instead of being shipped in the usual pails, is put up in cans holding 40 pounds each, made of the lightest possible tin and said to weigh 3 pounds less than the ordinary kerosene tin. These special tins have been requested by Chinese customers, probably in order to save porterage charges, since it is understood that the tins are individually transported by porters to interior points after having been distributed to various provincial cities by the Shanghai importers. Four of these tin cans, weighing 40 pounds each, are packed in a case as strong, substantial and securely strapped as the manufacturers can make it. At first, round cans were used, but this manufacturer has learned the advantage of using square tins, and now has manufactured for him especially square tins with screw tops in the usual style, to hold the contents above noted.

Packing House Products.—One of the largest American packing houses supplies a number of photographs showing the fashion in which packing house products in tins are packed for export. Photographs on page 530 show cases of tins such as contain lard, oleomargarine, etc. The case is made of heavy pine, reënforced at each end, and so designed that if dropped on one end the strain will be equally distributed. The tins are protected by coarse shavings intended to prevent the denting or breakage of the individual containers. Metal straps are used at each end of the case to secure the boards and to strengthen the ends.

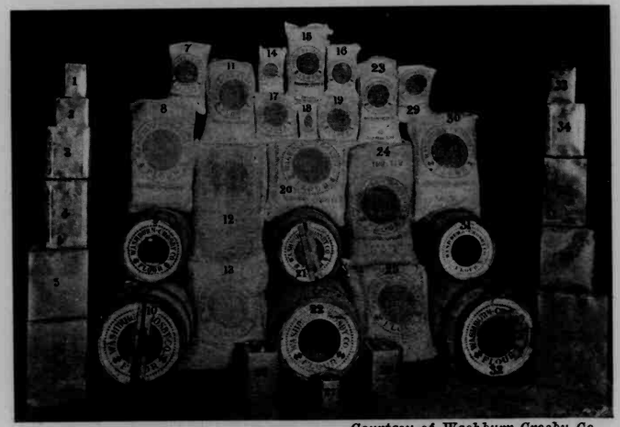
The photograph on page 530 shows three distinct



Courtesy of Swift & Co.

PACKING OF COTTON SEED OIL

Export packages made to withstand rough handling. Cases are exceptionally heavy. Tins are made to fit snugly and are protected by layers of shavings above and beneath.



Courtesy of Washburn-Crosby Co.

THIRTY SEVEN METHODS OF PACKING FLOUR.

Tins shown are of ¼, 7, 1½, 22, 25, 28, 33, 44, 50, 55 and 110 pounds. In addition there are half-barrels and barrels with wire, flat and wooden hoops, as well as osnaburg, cotton, jute, and drill sacks of various sizes and weights demanded by foreign customers. This shows the extent to which one firm meets its customer's requirements.

INTENTIONAL SECOND EXPOSURE

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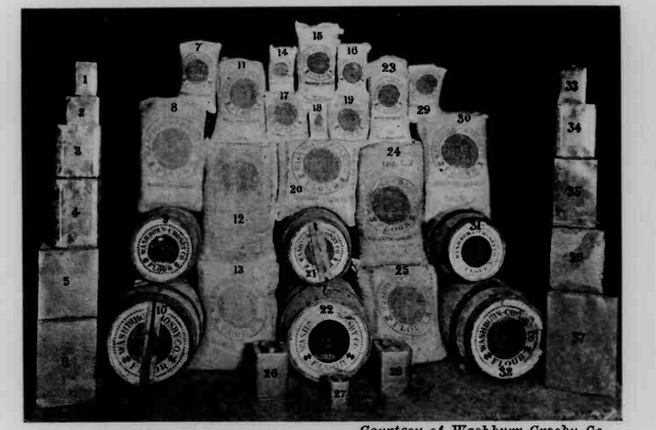
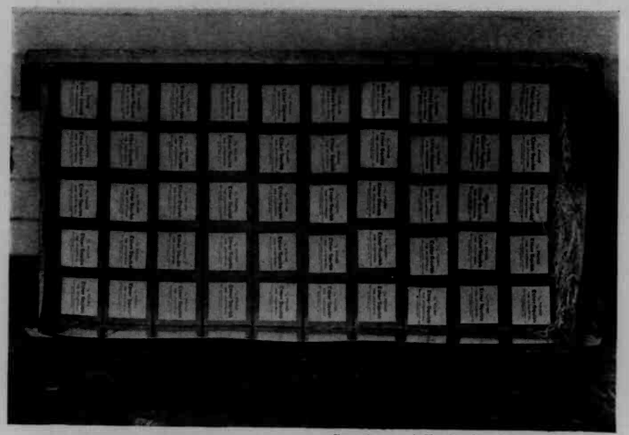


Courtesy of Washburn-Crosby Co.

THIRTY SEVEN METHODS OF PACKING FLOUR.

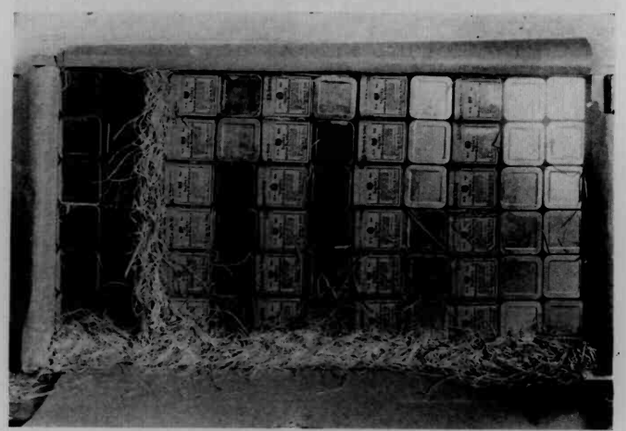
Tins shown are of 4, 7, 14, 22, 25, 28, 33, 44, 50, 55 and 110 pounds. In addition there are half-barrels and barrels with wire, flat and wooden hoops, as well as osnaburg, cotton, jute, and drill sacks of various sizes and weights demanded by foreign customers. This shows the extent to which one firm meets its customer's requirements.



Courtesy of E. R. Squibb and Sons.

PACKING OF ETHER.

Case containing 200 one-quarter pound tins of ether in regulation carton. Case is tin lined, but photograph was taken before top was soldered on.



Courtesy of E. R. Squibb and Sons.

CASE CONTAINING BICARBONATE OF SODA.

Case contains ¼ lb. tins some of which are packed flat to show manufacturer's label. Excelsior is used only to fill vacant spaces.

styles of packing, the case in the center containing four tins only, instead of 25. This is constructed of the same heavy lumber, and protected with similar iron straps, but in this instance the corners are reënforced from the inside instead of the outside.

Still another style of packing lard for export is illustrated in cut 3, page 530. This case is made for shipping to countries where packages are handled very roughly and are subject to being dropped on their heads or otherwise. The partitions shown are necessary in order to keep the weight of one tin from resting on another. In one case it will be noted that the larger tins are separated each by a partition, while in the other case the smaller tins have one partition only, near the center of the box. These distribute the weight more evenly to avoid damage. In both of these cases it will be noted that, in addition to the iron strapping at each end, an extra strap has been put about the middle of the cases, which not only strengthens the cases but prevents bulging from any cause and consequent sifting out of the shavings used for additional protection.

Cut on page 535 shows the method of shipping cottonseed oil in tins intended for destinations where rough handling is to be expected, because there exist no conveniences for unloading into lighters other than slings and ropes. The cases shown are exceptionally heavy and the tins fit as snugly as possible and are protected by coarse shavings, of which there is a layer both at top and bottom of the tins. The ends of the cases are protected by iron straps.

Packing of Flour.—Exports of wheat flour in 1919 amounted to nearly $300,000,000, and whereas this was in a sense a record, the exports of this commodity have for many years run into large figures. Although the demand recently has been one due to urgent necessity, this fact has not in any measure caused experienced flour exporters to depart from carefully thought out export methods, and from the policy of doing everything possible to please customers and literally follow instructions.

There are few commodities which present a greater variety of packing than is the case for flour, and in this instance, like so many others, the standard packing methods are the result of following the customers' instructions, which in turn are dictated by local conditions or local necessity. Thus in the case of one well-known exporter, to whom the author is indebted for the photograph used with this text, there are no less than thirty-seven different packages used in the ordinary foreign trade routine. This variety is the result of many years' experience, and each package corresponds to some requirement of a foreign country, or in the case of the large, more or less regular sacks, to the lack of requirement.

While American flour is usually exported either in barrels or in bags, yet there is a considerable demand for this product in tins, to meet which one of our largest millers provides a great variety of tins, some of which are illustrated on page 535. The tins in question are provided in many different sizes, as individual customers in different markets of the world may request and instruct. Thus those illustrated in the photograph include tins of 4, 7, 14, 22, 25, 28, 33, 44, 50, 55 and 110 pounds. Some of these denominations are, it will be noted, intended for countries using the metric system of weights. Other sizes are intended for retail packages in very hot, damp tropical countries, and usually in parts of such countries very difficult of access, where packages must be small and light for ease of transportation, and tin containers are essential for the preservation of the flour in retail establishments.

Chemical Products.—Photographs supplied by a prominent manufacturer of chemical and pharmaceutical products illustrate methods adopted for packing such products in tins. An accompanying photograph (page 536) shows a case containing 200 quarter-pound tins of ether, each tin in the usual carton. Cases are tin-lined, and packed; the top is next soldered on, guarding against the corrosion of the tin containers through the

action of sea water or sea air, and resulting leakage.

Another photograph shows a case of bicarbonate of soda in quarter-pound tins. A feature of this packing is that the manufacturers lay some of the rows of cans flat in order to display their labels, excelsior being used only to fill in vacant spaces.

A third photograph (page 549) from another house, represents a standard case of 12 one-gallon tins of antiseptic fluid. It will be noted from this photograph that 4 tins are placed in each carton, 3 cartons—that is, 12 one-gallon tins—making a secure and compact shipping case. Particularly to be observed is the fact that inside of each carton of 4 tins a wooden block has been placed, in order to prevent the shifting of the cans while en route, which would result in throwing their full weight upon the handles, crushing them down, and possibly cutting into the cans themselves, thus causing loss from leakage.

Packing of Compressed Hops.—As a rule deterioration in any one of its various forms is taken care of by different sorts of glass or metal containers which prevent contact with the infecting microbes of the air, the containers themselves presenting us with the packing problem. In the case of hops, however, the packing case may be at one and the same time the shipping container and the means of preserving the delicacy and value of the commodity.

A high quality of hops is alone obtained by air-drying at a low, even temperature, the air being fanned through the mass and the moisture removed by forced air draught. Drying hops by artificial heat depreciates the quality of the oils, converts the soft resins into hard resins, and destroys to a great extent the brewing value of the hops. It is these oils and resins that the export package of hops must conserve, and the flavor and aroma must be preserved in spite of transportation hazards and climatic perils.

A house with a large export business describes its export package as follows (see cuts, page 549):

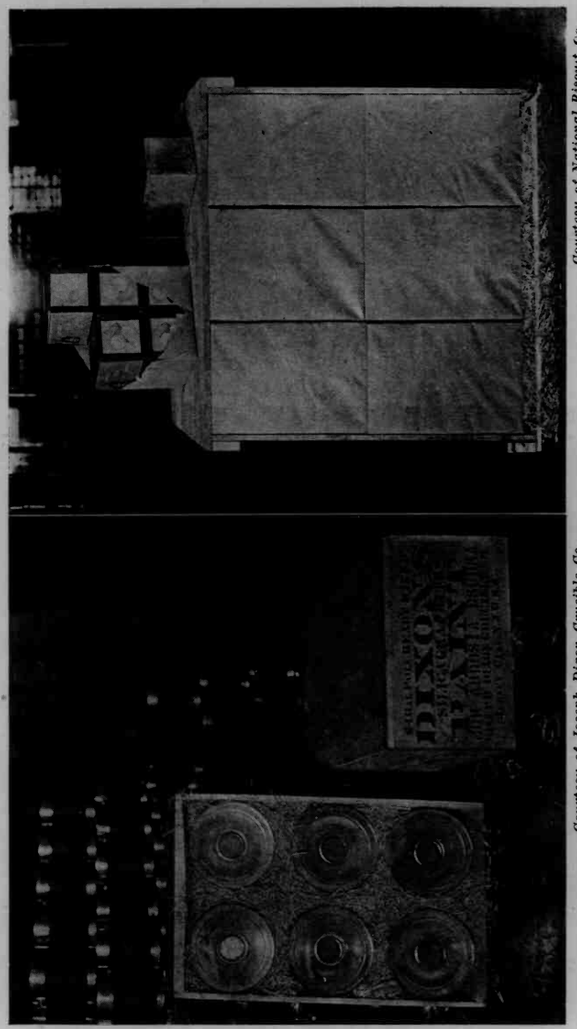
"Our Style No. 250 packing:—These hops are first pressed into cakes or slabs 16" square by 1¼" thick, and weigh 8 pounds net, and 44 of the cakes are packed in tin-lined wooden cases. To offer additional protection against damage, the case is lined with a heavy paraffin kraft paper. This packing protects the hops against loss of flavor. The case can be shipped to any climate without danger of hops being damaged by the aroma from other merchandise.

"Our packing No. 251: The hops are pressed the same as in packing No. 250, except that 7 cakes are packed in one tin containing 56 pounds net—3 tins per case, making a total net weight per case of 168 pounds. This package is especially suited for the Central and South American markets where the exporter or jobber buys in case quantities, and wants a package that can be unpacked and redistributed in small quantities without exposing contents to damage from climatic conditions or insects. The cost of this extra packing does not exceed 3 cents per pound. The maximum weight per cubic foot can be shipped in these cases. This we claim as a very big improvement over the old method of packing hops for export shipment, and it is meeting with the hearty approval of the trade in all sections of the world."

Printing Inks in Export Tins.—The author esteems himself fortunate to have the following interesting and very highly valuable communication written for this volume by O. L. Peabody:

"The packing of printing inks for the export market is a subject that requires careful study and considerable experience if results satisfactory to the consumer are to be obtained. The best of packing materials should be used. Every care must be taken that cans, cases and all other packages are made of good quality material and heavy enough to stand the rough usage to which the packages are subjected in traveling long distances.

"Export shipments are subject to a large number of handlings; such as the inland trip to tidewater, cartage at the port of shipment, possibly to a warehouse and later



Courtesy of Joseph Dixon Crucible Co.

ANOTHER METHOD OF PACKING PAINT

Package of 6 one gallon cans packed in excelsior to prevent shifting. Case is bound with strap iron to prevent breakage in transit.

Courtesy of National Biscuit Co.

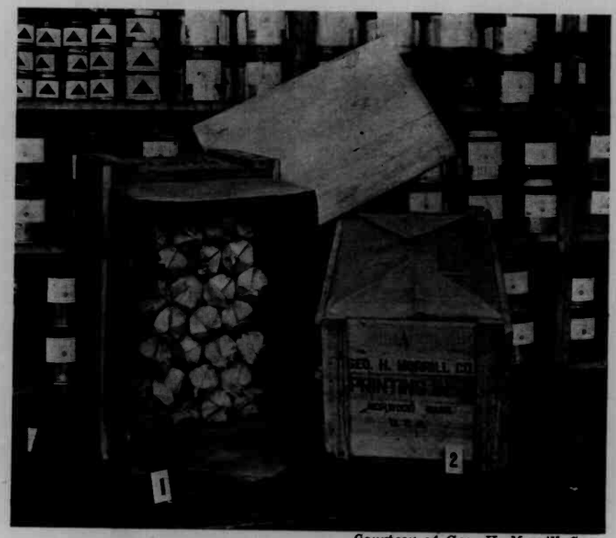
(1) PACKING OF SMALL TINS OF BISCUITS.

Biscuits exported by this house are packed in hermetically sealed tins. Small tins are wrapped together in units of 6 or 12 in heavy paper glued at both ends.

Courtesy of Geo. H. Morrill Co.

PACKING OF PRINTING INKS.

(Left) Shows method of wrapping cans in paper to protect labels, waterproof case lining and wooden packing case. (Right) Case ready for shipment showing method of strapping, nailing and stencilling.



Courtesy of Geo. H. Morrill Co.

PARTLY PACKED CASE OF PRINTING INKS.

Rolls of cans, packed in paper, are firmly bedded in shavings. A waterproof case lining is likewise used.

to the steamer, also loading into the vessel, generally in a sling with many other materials. The same process is repeated at the other end of the journey where the situation is sometimes complicated by the fact that it is necessary to lighter the cargo. In the final analysis, many of the shipments are carried on pack animals into the interior of the country. On account of the various handlings, small packages are preferable to larger ones because they are easier to handle and are proportionately stronger.

"Every batch of ink which my company manufactures has not only the number and name of the ink, but also a serial grinding number. This grinding number refers to the particular batch of ink in question. A small sample of this batch is kept and also a full and complete record of what went into the batch and all other facts concerning it, so that if at any time later the company is furnished with the grinding number, full and complete information about the batch may be had and also, which is more important still, a sample of the actual batch of ink in question is available. Every package of ink turned out by our company carries this grinding number either by perforation in the band around the can, a perforated metal tag attached to the package, or by stenciling. This has been found to be a very valuable feature. The name and number of the ink are shown on the label.

"Ink is packed in ½, 1, 5 and 10-pound cans. Cans for the same quantity of ink may vary greatly, but this is unavoidable. Care is taken to select cans such that the pound of ink completely fills the can. This is necessary in order to avoid having the ink flow about in the can and mixing into the ink any skin that is formed. Therefore it happens that while a number of cans may contain one pound of ink, the sizes of the various cans vary considerably. Although this necessitates carrying in stock many different sizes of cans, this bad feature is amply compensated for by the fact that when each can is full the ink reaches the customer in good condition. There is a wax paper placed on the top of the ink after

the can is filled, the cover is put on, and the can is then banded with a substantial paper band, after which it is labeled. Three things in connection with the banding and labeling are noteworthy: first, the character of the labels; for it is to be noted that the labels are designed to be characteristic and serve as a trademark or means of identification of the inks, no matter where the cans may go, and each can also carries the label of the representative who handles the ink; second, the grinding number perforated in the band which is also an important feature; third, liquids are packed in screw top cans, which are also banded and labeled, as are all of the cans of our manufacture.

"The wooden cases in which all cans (and tubes) are shipped are very important in export shipments. The case used is of special construction as shown in cut page 542. Attention is called particularly to the following: the small size of the case, 27¼" x 17¼" x 15½", outside dimensions; the thickness of the wood from which the case is made,—⅞" stock; the way the case is constructed,—particularly the cleats on the end and the way they are built in connection with the rest of the case (cut page 542 shows this feature, which gives a corner which protects the cleat, making it practically impossible for the cleat to be pulled off, and also holds the cover in position); best results are obtained by using sufficient nails, but not too many, coated nails being the best.

"In order to make the cases as waterproof as possible, a heavy manila paper bag lining is used. This lining is made of two thicknesses of manila paper with a tar preparation between, making a practically waterproof paper. The lining is made the exact size of the inside of the case so that it drops down into the case without folds or creases. This lining is shown at the left in cut page 542. The rolls of cans are placed in the case as shown in cut page 542, and shavings, which are much better than sawdust, because they do not sift out, are packed carefully around each roll of cans and tamped down solidly, which gives a very firm packing of the cans in the case. A case

so packed is shown in cut page 542. The lining is then folded over as shown in the same cut, and the cover nailed on the case.

"After the case is nailed, it is strapped with iron, as shown in cut page 542. This strapping is put on with a special machine which draws it so tight that the strapping absolutely cuts into the wood at the corners, after which it is sealed with a special seal, as shown on the top of the box, cut page 542. A nail is driven through the strapping and through each board of the case. This not only holds the strapping securely, but discourages pilfering. The case is then ready for stenciling.

"Great care should be used in stenciling cases in order that it may be easily read, and so that there can be no question as to any of the lettering on the case. This is also shown in cut page 542.

"Five and ten-pound cans are packed in the same size cases in a similar manner. The cases are comparatively small, because printing ink is a relatively heavy material, and it is found that the smaller the cases, the stronger they are and the better they travel. These cases have been used for export shipments for the past twelve years without a complaint from any customer on account of faulty packing.

"Years of experience and many experiments have shown the methods described to be fundamentally necessary and correct for the successful packing of printing inks for export. They are fundamental for all export packing. The principal object is that the goods shall reach the ultimate consumer in an attractive form, packages unbroken and in good condition, and this latter statement is especially true of the labels."

CHAPTER XX

EXPORT PACKING OF GOODS IN CARTONS

THE neat and attractive fashion in which a large and increasing variety of American goods of all descriptions are put up in cartons for the retail trade show-window and shelf and counter display, has attracted the admiration of foreign merchants all around the world and the envy of European manufacturers of similar products. The English trade papers especially have repeatedly urged on British manufacturers an imitation of American practices in thus packing shelf and counter goods. The packing of such goods in cartons for export shipment, therefore, involves primarily the delivery of the contents of cases to customers in distant lands in the salable and attractive condition in which they leave the original shipper, that is, in the condition in which the maker of the goods intends and expects they will arrive and be placed on display by retail dealers, no matter where situated.

At first blush it might be thought that packing for export shipment of such commodities as are now under consideration would involve no special problems,—that all anyone would have to do would be to take the individual cartons, stow them away in the case, nail it up, and forward it. But on maturer consideration it will be recognized that there are a great many considerations which ought to have thoughtful attention. In the first place the strength of the cartons employed when goods are despatched to overseas markets ought, in many instances, to be superior to the somewhat flimsy cardboard occasionally used with some products for domestic sales purposes. In intimate connection with that consideration comes the question of the size of cartons, and the packing of the goods themselves within the cartons. As has been re-

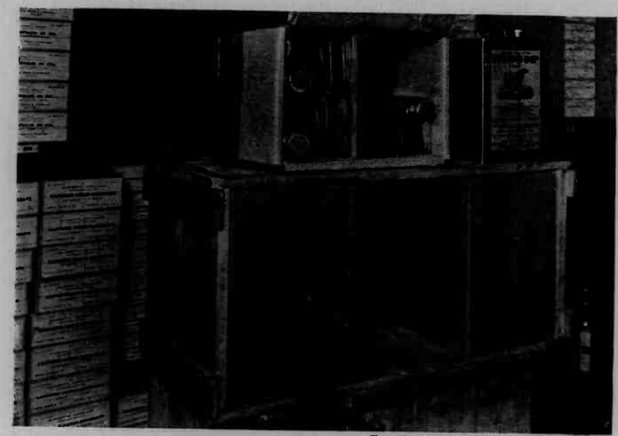
peatedly pointed out in this volume, waste of space in foreign shipments means increased freight charges on the goods, and if an unnecessary freight cost, even of 2 per cent on the value of the goods, can be avoided it is obviously highly desirable that the shipper should adopt every possible measure to affect this saving and space reduction. Many cartoned goods are shipped for export in identically the same fashion in which they are supplied to trade here at home. In the latter trade it is obviously of no moment at all whether the contents of a carton fit exactly or snugly, or whether there may be half an inch in length, breadth, or thickness which is unoccupied by the contents. This waste of space may, however, be a highly important matter in export shipments; take, for example, a case containing 60 or 100 cartons of no matter what product, and if there is a waste of space in each carton of half an inch in length and a quarter of an inch in height, it is not difficult to figure out that the unnecessary cubic space occupied by a case containing such a quantity of cartons would easily measure a total of two or three cubic feet. This might mean paying unnecessary freight and other charges of as much as two or three dollars on the case in question, and this unnecessary charge might amount to a total of 2 per cent of the value of the contents. Furthermore, if the contents of a carton do not exactly fill it there is certain to be a good deal of play and rubbing or knocking of the contents in the course of repeated handlings before the shipment reaches its ultimate foreign destination, and hence if the cartons themselves are not strong and substantial they are not likely to arrive in immaculate condition. On all of these accounts, therefore, most careful thought ought to be given to the desirability of special cartons for export.

Of course shipping any commodities in cartons is not the most economical possible fashion of so despatching them by steamship. The packing in cartons inevitably involves the use of considerably greater shipping space than would be necessitated were the same commodities

packed in bulk, without the use of cartons. However, importers and retail merchants in other countries prefer to pay the higher freight charges involved when goods are forwarded in attractive cartons. These materially assist in increasing sales at retail, and no American manufacturer should contemplate shipping in bulk when this element of attractiveness of the package is an important one—at least, unless his foreign customers specifically urge and instruct the abandonment of the carton. Instances have been known where, in certain Latin American markets, where differing rates of duty apply to cases containing mixed commodities, importers have instructed that the goods themselves be packed separately, in bulk, and that the cartons in which the goods are ordinarily shown and sold at retail be separately shipped, in order that the importer, after securing reduced import duties through such shipment, might properly repack the goods in the cartons after receipt in his warehouses.

Before passing on to other considerations affecting the packing of goods in cartons, it should be noted that the interior packing of cartons should be designed to prevent any rubbing or similar damage to their contents. These should fit closely, or if not, be adequately protected by wrappings or stuffings of tissue paper or other materials, as the nature of the contents might require. This applies particularly when contents do not exactly fit the cartons.

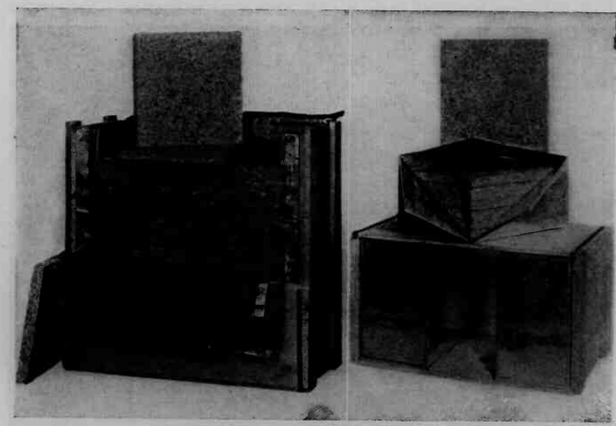
It would appear to be true that most manufacturers and shippers of commodities now under consideration employ stock cases for their export shipments. In the domestic trade the commodities in question may be and probably usually are sold in standard quantities, a dozen or a gross of one article, 50 or 100 of another article, perhaps 48 or 60 pairs of shoes, and so on. Stock cases adapted for such standard quantities may be entirely suitable for export work, but a good many foreign orders involve shipment in other than standard quantities, and very frequently may involve shipment of odd quantities of assorted goods. In such instances stock cases ought



Courtesy of Parke, Davis & Co.

PACKING OF ANTISEPTIC FLUID.

Standard case of 12 one gallon tins. Four tins are placed in each carton, and three cartons fill case compactly. Each carton contains a wooden block to prevent shifting of tins.



Courtesy of E. Clemens Horst & Co.

PACKING OF COMPRESSED HOPS.

(Left) Hops are pressed into cakes 16" square by 1¼" thick and weighing 8 lbs., 44 cakes being packed in tin lined case. (Right) Another method of packing hops. Seven cakes are packed in one tin containing 56 lbs., three tins being packed to a case.

Courtesy of Hanan & Son.

PACKING OF SHOES.

Case contains a waterproof lining which is folded down over top to prevent damage by moisture.

Courtesy of Joseph Dixon Crucible Co.

PACKING OF ASSORTED LEAD PENCILS.

The shipment is carefully protected by paper linings, iron straps, and the open spaces filled with excelsior.

not to be supplied unless they exactly fit the quantities of cartons which are to go forward. It is much better to have special cases built rather than attempt to stuff with excelsior or paper the vacant spaces, which may be left by packing in a stock case a miscellaneous assortment. Furthermore, stock cases ought, of course, never to be used unless they are of weight and character entirely suitable for export shipments—that is to say—of the description which has elsewhere and at numerous points in this volume been described and strongly emphasized.

Waterproof linings for cases to contain goods in cartons, and in many instances hermetically sealed tin linings for such cases, are peculiarly necessary; and sometimes soft linings or cushioning between the walls of the case and the cartons, or even between the rows or layers of cartons are equally important, since the preservation for arrival in attractive condition of the appearance of handsome cartons is a prime desirability in almost all such shipments. For similar reasons special care must be taken, in nailing on the covers of such cases, to guard again nails entering within the case and perforating or otherwise damaging the cartons with which they come in contact.

Almost all goods ordinarily shipped in cartons are peculiarly the objects of solicitude on the part of pilferers, who prey on export shipments on dock and on board of steamers, in no matter what part of the world. Shoes, confectionery, foodstuffs—all these, and in general most cartoned goods, must be very thoroughly protected by every known device against the danger of pilfering, and in this connection study should be made of the special chapter in this volume devoted to this subject.

Export Packing of Shoes.—In the packing of leather shoes it is of prime importance to protect the goods against moisture, and this is commonly done by thoroughly waterproofing the case and securing the goods against all possible contact with dampness. In certain cases, such, for example, as the export package of a well-known company to whom thanks are due for photographs

reproduced on page 550 the case may be tin or zinc lined, a practice that is very general with shipments going to South America. Furthermore, the usual requisites of stout cases is more than required in this case because of the danger of pilfering.

This last point is extremely important in the case of shoes, for we have here an ideal class of merchandise for the pilferer. Of use to anybody in any country, easily concealed and transported, equally easily disposed of, every effort should be made to see that safety seals are placed on the cases and that the contents of the shipment are as fully disguised as possible.

A large company, other than the one mentioned above, states: "As regards information relative to the way our shoes are packed, we beg to state that, first, we check the shoes on to our packing table prior to having them placed in the cases; then, as they are placed in the case they are rechecked. This practically precludes mistakes in our count.

"The cases are made of selected gum, free of knot holes or knots, having ½" sides, ⅞" heads, and the heavier case is reënforced with ⅞" strips 4" wide all around. The shoes themselves are packed in a waterproof liner made of two layers of heavy paper with a thin coating of waterproof substance between the layers. This paper comes in the shape of bags, which are fitted into the case, and the shoes are placed inside the bag. When the required number of shoes are in the case, the bag is folded down on the top in such a way as to prevent against water seeping in through the openings. The lids of the cases are then nailed on securely with coated wire nails and strapped all around with ⅞" metal strips, the ends of which are inserted through a patent seal, and a nail driven through that seal. We place no identification marks on our cases to show what is contained therein, nor does our name appear thereon in any place. We thus eliminate the feature of having the cases show that they contain shoes, and since we have followed this method our percentage of pilferage has materially decreased."

A third large shoe exporter states: "In forwarding our shipments to foreign countries we have found in our experience that a number of different methods are required, according to the point of destination. For instance, on shipments to the West Coast of South America the risk of theft and pilferage is very high, and shipments are, therefore, packed with the view to avoid this extra risk. As you no doubt know, most of the goods arriving at West Coast ports are lightered from the steamers, as wharfage facilities are few, and this process adds greatly to the chance of pilferage. For this reason our shipments to the West Coast are first packed in ordinary wooden cases such as are used for shipment in this country, and are then repacked in heavy ⅝" stock wooden cases, which are ordinarily known as dry goods cases. These cases are strapped at both ends and sealed, and as an extra precaution a wire band and seal are placed around the center of the case. Each separate board is nailed individually; also the strapping is nailed to each board. On shipments to the East Coast, the cases are lined in the usual manner with waterproof paper. The strapping and sealing are the same. This method we have also applied on our shipments going to the continent of Europe.

"You are, no doubt, familiar with certain requirements which call for packing out of the ordinary. We have been requested at times to wrap our wooden cases in burlap, which cannot be tampered with without showing traces.

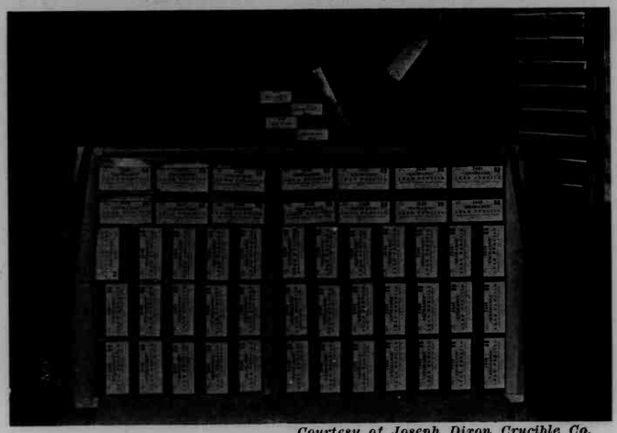
"Our patent leather shoes are generally packed in parchment paper, which is the best protection against the wearing off of the varnish used on the patent leather. However, on shipments to some of the Central American countries where the climate is damp, we use, in addition to the oiled paper, cotton-batting paper, which we have found gives good results in all cases."

A variation of the usual fashion in the packing of shoes for export is reported from Cuba, where certain manufacturers, probably by agreement with their whole-

sale customers on that island, are accustomed to packing 12 single cartons of shoes in one large pasteboard or fibre carton, securely wrapped with paper, and tied, and labeled with description, number of pairs of each size, etc., in order that the wholesale distributor may easily reship small lots to his retail customers in the country. The cartons are of course enclosed in a suitable shipping case.

As an instance of bad packing, a New York firm of foreign freight contractors tells of a shipment which it encountered, typical of many, which brought to light an appalling indifference to packing for export. The shipment in question consisted of some 1,500 cases of shoes, originating in Chicago and destined to a point in Roumania. The shoes were packed in cases made of lumber which was not any thicker than an ordinary egg case, and were only strapped with very thin wire. The shipment, upon arrival in New York, was naturally in very bad condition, practically every case having to be recoopered, involving considerable expense. This firm calls attention to the fact that in this particular instance the shipment was very poorly packed even for a domestic movement, and that if it had been allowed to proceed without recoopering, on the assumption that the steamship company would accept it in such a condition, the shoes would have arrived at destination in very bad shape indeed.

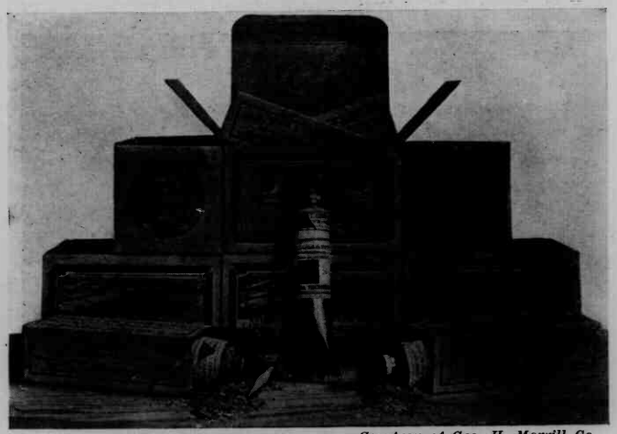
Packing of Rubber Boots and Shoes.—A large manufacturer of rubber footwear states: "Rubber footwear for domestic consumption is packed in cardboard boxes, usually 24 pairs to the case. For export we have been using a specially constructed case of 1″ material, cleated, and with reënforced ends. We have never had trouble on our shipments that have been packed in the special export cases. The standard domestic containers are very unsatisfactory. We also ship the goods in bulk, removing the cardboard boxes wherever it is possible, which shows an economy of 40 per cent in the shipping space. Our trade is supplied with a list showing the cubic measurements, and the gross and net weights of the various



Courtesy of Joseph Dixon Crucible Co.

CASE OF LEAD PENCILS.

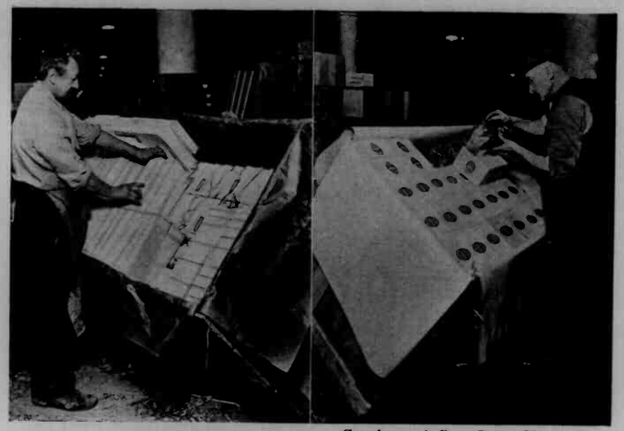
In this instance the case contains a shipment of lead pencils all of the same grade and size.



Courtesy of Geo. H. Morrill Co.

PACKING OF PRINTERS' INK IN TUBES.

Collapsible tubes are placed in printed cartons and solidly packed with sawdust. Four ¼ lb. tube cartons are then placed in a large carton, making an attractive 1 lb. package of ¼ tubes, each in its separate carton.



Courtesy of Geo. Borgfeldt & Co.

PACKING OF NOVELTIES AND TOY SEWING MACHINES.

(Left) Christmas tree ornaments in boxes, which are sectioned to prevent breakage. Boxes must be closely packed to prevent jostling. Oiled paper lining is used to prevent injury to painted decorations. (Right) Toy sewing machines are wrapped in paper, to prevent injury to the mechanism, excelsior is not used inside the carton, it is however placed between each two layers of boxes.

Courtesy of Geo. Borgfeldt & Co.

PACKING OF DOLLS.

Dolls are easily broken. Each doll is tightly fitted into box with corrugated paper and excelsior, enough excelsior being used to give spring should box be dropped. Boxes packed in even rows and spaces between well filled with excelsior.

rubber shoes packed under the two methods described.

"We have simplified our replies to general inquiries so that it is covered in one paragraph, which reads as follows:

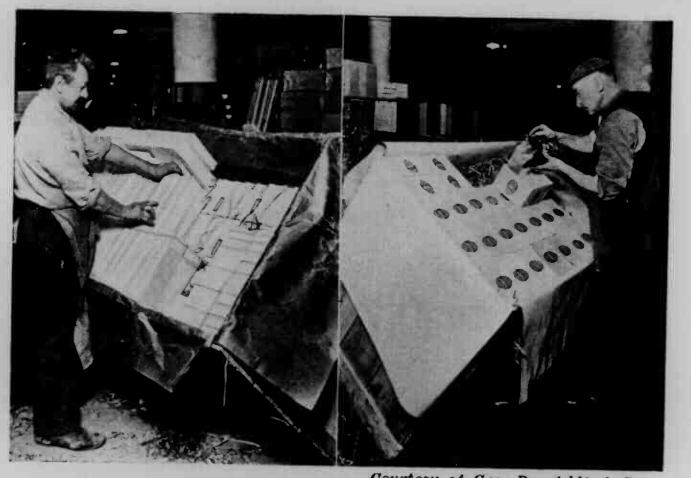
24	pairs	to	case —	women's	3½	cubic feet
24	"	"	"	men's	5	" "
100	"	bulk		women's	5	" "
100	"	"		men's	8	" "

"The objection to packing most goods in bulk is due to the condition under which they arrive at destination. The Europeans have had sufficiently cheap labor in the past to pay particular attention to the finish of their goods, with the net result that American goods packed closely to conserve space almost invariably lay the manufacturer open to a question as to the finish of his goods, due to the condition under which they arrive.

"It is our experience that it is advisable to take additional space and have the goods arrive at destination in the best manner possible, dividing the cost per case by the number of units contained therein. This shows only a small additional cost to have the goods in proper condition. It is our judgment that the American manufacturer would do well to study first the condition in which his goods will arrive in the foreign market, and then the economy in space that it is possible to obtain when the goods are properly packed."

Another large shipper of rubber footwear informs us that goods are shipped 24 pairs to the case, each pair in a carton, and wrapped in tissue. The lumber is ⅜" white pine, and the effort is made to keep the case as light as possible. The cases are not sealed, and well-nailed straps have been found sufficient protection against pilfering, although every effort is made to keep identifying marks off the cases. Rubber boots are packed 12 pairs to the case, with the same carton and tissue covering as in the case of rubber shoes. All rubber goods go as measurement cargo. In the case of shipments to Great Britain it has been found unnecessary to strap cases, although ship-

INTENTIONAL SECOND EXPOSURE



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ments are confined to one or two of the largest trans-Atlantic lines.

Cereals in Cartons.—A large manufacturer and shipper writes that cereals are exported both in cartons and in tins. In regard to former packing this manufacturer states: "Packed in shells or cartons, 7 15/16″ x 4¼″ x 3¾″, made from .033 chipboard, and firmly glued on both ends. Wrappers are pasted or glued all over, making an air-tight package. The packages are shipped in nailed and wire-bound cases, 36 packages to the case, and weigh 2 pounds each. The nailed case has ⅜″ sides, tops and bottoms, and ½″ ends, each end having two outside cleats 2″ x ½″, running the full depth of the ends. Wire-bound cases are made from 1¼″ hardwood, veneer, and are reënforced on sides with cleats measuring ¼″ x 15/16″, which run full length and depth of side. There is also a batten 2″ x ¾″ down the center. The case has four 14-gauge wires running the long way of the case, and fastened with staples 3″ apart. The same goods are shipped in 1-pound packages, 72 packages to the case, in the same way."

Confectionery in Cartons.—A good deal of American confectionery of various descriptions is exported in cartons, especially to such nearby markets as the West Indies. No little discrimination seems, however, to be called for in determining upon carton shipments for such products. Unless cases are lined with tin and hermetically sealed, it would seem doubtful that the confectionery in cartons would arrive in desirable, even in salable, condition in most foreign markets, above all when such shipments have to pass through hot, tropical or semi-tropical waters. Even if cartons are packed in hermetically sealed, tin-lined cases, still there is always to be remembered the possible deterioration of the confectionery merely through the effects of heat, and this applies to American confectionery more than any other, because of the use by our manufacturers of cane sugar, or more often glucose, neither one of which will withstand heat as does the beet-root sugar usually employed by European manufacturers of such products. The latter, it may be said, far more generally employ tins, and far more seldom utilize the carton, than do American manufacturers.

An exporter of confectionery writes: "Half-pound cakes of Oriental chocolate are each wrapped in tin foil and a regular trade label, as used in the stores on this side of the water. They are packed in 7-pound cardboard boxes, and if necessary to make the cakes fit tightly, corrugated paper is laid between them and the sides of the box. Sixteen boxes are packed in each case, a strong wooden case being used, and the cases, except as noted below, are lined with waterproof paper. Net weight, 112 pounds; gross weight, about 140 pounds; size, 2.10 cubic feet.

"If the goods are being shipped to a very hot climate a layer of tin is used for lining instead of the waterproof paper. The tin is made to the inside measure of the packing case, and a tin cover is soldered on, so that it forms, to all intents and purposes, a tin inner case fitting close inside the wooden case. Cases are banded with two iron straps pulled tight and nailed."

Sundry Cartoned Goods.—An example of the mixed packing of different kinds and sizes of goods in cartons may be noted in the accompanying reproduction of photographs containing lead pencils (see pages 550, 555). It will be noted that in one instance pencils are all of one grade, and exactly fill the case, while the other case is not filled, and the open spaces have been stuffed with excelsior.

An illustration of the packing of collapsible tubes which are used with so many different kinds of products, and enclosed in cartons, is to be noted in the photograph supplied by a large manufacturer of printers' ink which is reproduced on page 555, and in regard to which the manufacturer writes: "Ordinarily one-quarter and one-half pound lots of ink are packed in collapsible tubes. The tubes used are made of good quality burnished metal, and are filled on a special tube filling machine, after which the end is crimped over and the tube is labeled,

presenting the appearance as seen in photograph, where a tube is shown in the foreground. Each tube is then placed in a printed carton and the carton filled and solidly packed with sawdust, as indicated in the picture. Four of the one-quarter pound tube cartons are then placed in a large carton, making a very attractive one-pound package composed of four tubes, each in its separate carton. This carton is shown in photograph." A description of the wooden cases employed by this particular manufacturer is given under the head of printers' ink in the chapter devoted to the packing of tinned goods.

Examples of novelties of various descriptions, toys, etc., shipped in cartons, and the packing for export believed desirable in such instances, are to be observed in three photographs (see page 556). The shippers describe their packing of these cases for shipment in the following language: "The accompanying photograph shows the packing of a case of Christmas tree ornaments. It will be observed that the cartons are divided into sections, to minimize the risk of breakage. These cartons must be packed into the outer case just closely enough to prevent jostling, but equal care must be taken not to pack too tightly. Note the oil paper lining of the case, which is always used for export when anything is packed that may be subject to damage from moisture.

"Another photograph illustrates the packing of a case of dolls, which are very breakable, being made of plaster pulp, a brittle composition containing plaster of Paris. Each doll is fitted tightly into its carton with corrugated paper and excelsior, so that it cannot move. Enough excelsior is used in each carton to give spring, should the case be dropped. The boxes are packed in even rows, the spaces between being well filled with excelsior.

"The third photograph shows the packing of toy sewing machines, each in an individual carton, the toys being wrapped in paper. A thick layer of excelsior is placed between each layer of cartons, but no excelsior is used inside of the cartons themselves to guard against

dust injuring the mechanism of the toys. The tilting of the case, as shown in the photograph, should be noted." This shipper states that nothing except dry goods is ever packed in his plant without tilting the case or barrel.

CHAPTER XXI

EXPORT SHIPMENTS IN BARRELS

COMMODITIES shipped for export in barrels are almost limitless in variety and include some kinds of merchandise for which the use of barrels in domestic shipments by rail within our own borders would arouse no end of astonishment. Barreled goods, as related to the problem of export packing, comprise not only liquids of every description, from alcohol to lubricating oils, commodities in powdered form, from flour to chemicals, and commodities in solid condition, such as rosin, but also include many forms of hardware preferably shipped for export in barrels, to say nothing of such products as wire nails, glass, crockery and all sorts of products, from tobacco to sausage casings.

There are certain quite obvious requirements applying to the overseas transportation of barreled goods of any description, whether in tight barrels or slack barrels, or whether in tierces, half barrels, kegs or in pails or other packages to be classified in a general way under the heading of barrels. Such considerations include, for example, protection against leakage of liquids and protection against sifting of powdered contents. Other things to be considered which may not at first immediately suggest themselves, include protection against pilfering of contents from barrels, for valuable contents may be pilfered from barrels as greedily as from cases, and even in shipments of such a commodity, apparently far from tempting to thieves, as sausage casings, complaints have been received from abroad of extensive pilfering from the center of barrels.

As in all export shipping, manufacturers or others who forward their goods in barrels, ought to study attentively conditions in the markets to which their goods are

despatched, as this may possibly affect the character of barrels to be shipped. For example, there are some foreign countries in which barrels, when emptied of their original contents, are worth more locally than their original cost at point of shipment. Therefore, there is a great advantage in supplying sufficiently good barrels to ensure their arrival in good condition and without damage, in order that the buyers of the merchandise thus shipped may realize highest possible prices for the containers, and thus be better pleased with the merchandise and with the services of the American concerns from whom purchases have been made. In the Amazon district of Brazil, for example, it has been said that oak barrels with hickory hoops are worth twice as much as they cost in New York, while soft wood barrels with flat hoops, arriving with heads split, are worth nothing at all and more than once have caused rejection by the importer of an entire shipment. Parenthetically, it should be noted that some European barrels, particularly barrels from France, command considerably higher prices at second hand than do American barrels at second hand, because of their superior quality over American barrels. Furthermore, the protection afforded by hardwood barrels against damage, and particularly destruction by rats on shipboard or while lying exposed on wharves, is also and always a highly important consideration.

Another illustration of the desirability of studying local conditions in markets to which barreled goods are shipped, is suggested by a report made a few years ago from one of the Central American republics that it is often advantageous to perforate the barrels and then fill up the holes soundly so as effectively to prevent the leakage of liquids or greases, because in some of the Latin American republics import tariff laws impose a duty on sound and water-tight barrels in addition to the duty on their contents, and the duty on the barrels themselves may be saved if, nominally at least, the barrels have been spoiled by the perforations which have been suggested. However, this is a rather fine point which

requires some technical study because barreled goods are quite as often in Latin America charged import duties on the basis of gross weight. Such a consideration as this supplies another argument for the close and intimate consultation of manufacturer or exporter with local clients in each foreign market.

Another recommendation which has been made by a New York export house shipping largely to the Far East is that in all shipments of oils or other liquids to tropical countries, or by steamships passing through unusually hot waters, considerable room should be left in barrels for the expansion of the liquids, which may be caused by the heat, as otherwise leakage is sure to occur and has frequently been experienced in the past. Complaints as to the leakage of liquids are by no means rare and will frequently appear in other paragraphs in this chapter. Some steamship companies, according to the New York exporter just quoted, have of late refused to accept dyes in barrels because of the heavy losses incurred from sifting and leakage and the damage done to neighboring cargo. It is said that the greatest number of complaints as to shipments in barrels come from defective "heading up," and that difficulties experienced are much more notable in barrels that have not been completely finished in cooperages and made to be filled at the bung.

Climatic conditions in the country to which a shipment may be destined, or seasonal conditions at time of shipment and at time of expected arrival of the goods abroad, may require consideration by exporters.

Leakage of oils when shipped in the winter and the contents are congealed has been reported as only three-quarters of 1 per cent, whereas, in summer, leakage of the same oils ranges up to 1½ per cent. In dry, hot weather the wood of the barrels dries out and iron hoops sometimes become loosened and even fall off. Facilities for loading, unloading and storage at port of shipment and port of discharge may enter into this question also, since it is clear that if barrels containing liquids are properly sheltered on wharves or in warehouses from the

direct rays of a very hot sun considerable reduction in risk from leakage is likely to result.

Considerable difference of opinion exists among exporters as to the desirability of barrels as export containers. One important New York merchant expresses the opinion in a letter that although in principle barrels are poor containers, yet they are peculiarly adapted for the shipment of such articles as china and glassware, offering better protection for such contents than could be obtained from a case of the same weight and size. This exporter further remarks: "In packing articles in barrels, however, care should be taken to prevent sifting or leakage. Reënforcing the heads, lining with waterproof paper (when dry contents are in question) and constructing them with tongued and grooved staves assist in preventing sifting. Placing extra hoops on barrels containing liquids and reënforcing the heads are additional ways of guarding against leakage."

However, another New York export merchant argues strongly that the use of barrels should be discouraged whenever possible in export shipments, declaring that there is an immense waste of space in packing, and that meats, fruits, chemicals, in fact, all kinds of merchandise should be by preference otherwise packed than in barrels. This clearly is a problem which each manufacturer must study and determine for himself as affecting his individual products and the conditions surrounding his packing and shipping.

Illustrations of practice and policy in shipping for export in barrels will certainly be of interest and should offer many hints and suggestions to manufacturers. Certain typical commodities may be selected in this connection and the following include extracts from letters of manufacturers and shippers bearing on this subject.

Packing House Products.—The great variety of products produced and exported by large packing houses in Chicago and elsewhere in the United States, involves the use of all kinds of packages, among them barrels possibly taking first place. One of the principal American pack-

ing houses sends us a photograph (see cut page 567), and writes as follows regarding its own manufacture of the necessary containers of this description:

"The millions of barrels, boxes, pails, tubs and other containers used by us annually in the shipment of packing house products come from two sources. Pails and tubs, some boxes and tin cans are manufactured by the company. A goodly number of barrels, boxes and cans are purchased from outside sources.

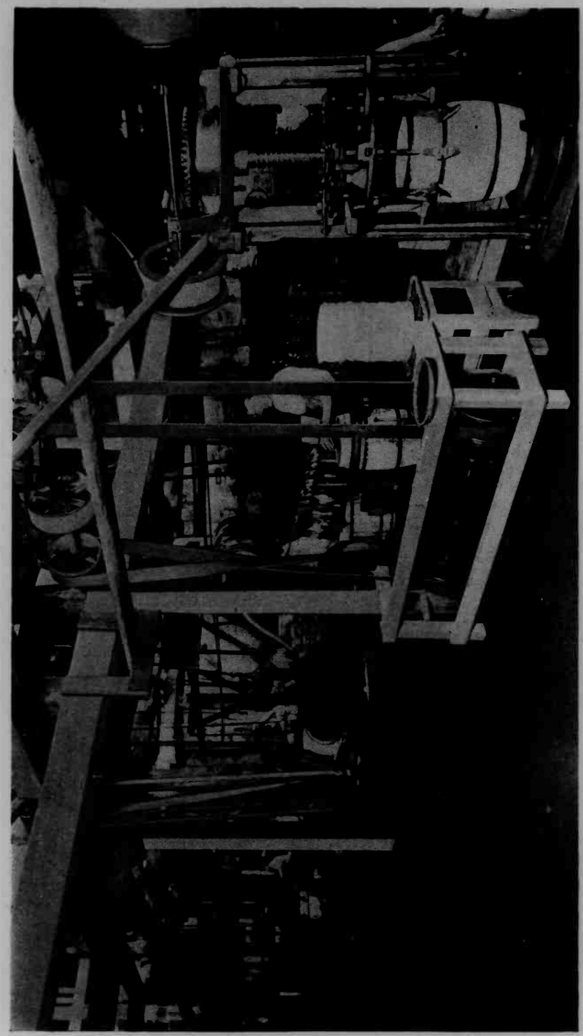
"Many packing house products come under the heading of perishable goods, which makes it important that there be no unnecessary delays in shipping them. Furthermore, a great number of containers are required each year. In view of these two facts, it has been natural for this company to establish its own box, barrel, pail and tin can shops, because in so doing it does not have to depend exclusively upon outside sources of supply for containers.

"An interesting feature of this story on containers for packing house products is to be found in connection with foreign shipments of goods—the types of containers and the way they are built. For instance, in taking care of the South American trade we ship from the United States a great many barrels in the form of shooks, these shooks being reassembled after they reach the various plants in the Latin American countries. By shipping the barrels in knocked-down form, a great deal of cargo space can be saved. By shipping the shooks instead of the finished barrels, all available space in the cargo can be utilized.

"White oak shooks, taking a 34″ stave and holding around 54 gallons, are used in the South American trade, which required 150,000 to 200,000 barrels a year during the war.

"As for the principal products put in barrels, among these may be mentioned lards, oleo oil, greases, fats, tallows, various kinds of meats, and fruit juices.

"For shipping oleo oil and lard the tierces used are made from white or red oak, with 34″ stave, 21″ head,



Courtesy of Armour & Co.

SECTION OF COOPERAGE PLANT.

Plant is maintained for the production of slack barrels, lard pails, etc., and is one source of supply of the millions of barrels, boxes, pails, tubs and other containers used annually in shipping packing-house products.

INTENTIONAL SECOND EXPOSURE

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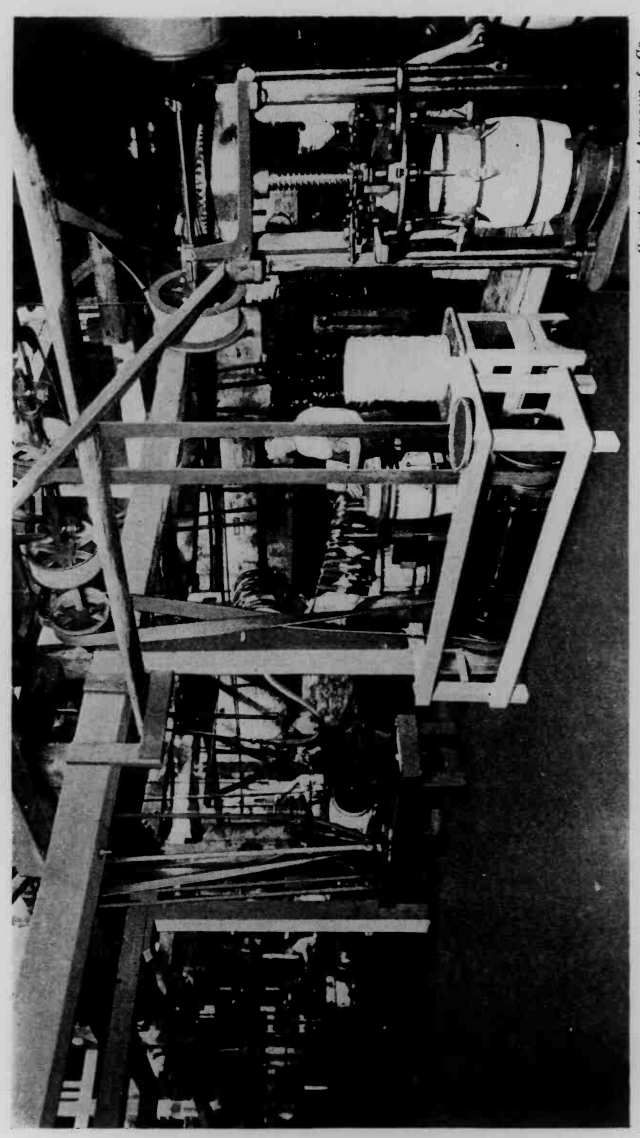

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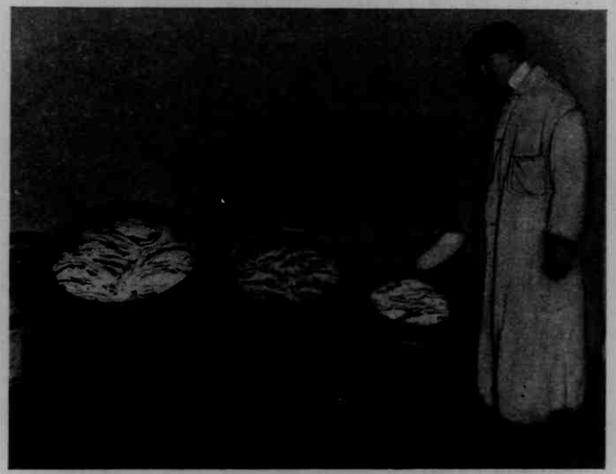
Courtesy of Swift & Co.

TIERCES FOR PROVISIONS.

Made to contain either pure lard, lard compounds or oils. Wood is carefully selected oak with 8 galvanized iron hoops, well driven and fastened.



Courtesy of Swift & Co.

PACKING OF PICKLED MEATS.

Meats in brine are packed in barrels, half barrels, and tierces. Wood is carefully selected. Hoops are galvanized iron protecting package on long journeys in tropical climates.

and six steel hoops. Their capacity is 50 to 52 gallons.

"Thirty-gallon barrels are principally utilized for pork. These are constructed of ash, with 30″ stave, 18″ head and bound with six galvanized iron hoops.

"In addition to these, half and quarter barrels, with a capacity of 100 and 50 pounds, respectively, are employed. Before the war 250,000 half-barrels of spruce a year were used for export lard, a considerable amount of which went to Germany.

"Mince meat is packed in 100 and 150-pound barrels, and in 50-pound tubs, which have inside dimensions of 14¾″ at the top, 11⅜″ at the bottom, and a depth of 11 3/16″.

"The shipments of casings require packages of 20 to 150 pounds capacity, the larger ones being of white oak, while for the smaller container a good, tight, hardwood package is used.

"All of the foregoing containers are in the class known as tight barrels. However, for the exporting of lard, glue, soap and similar products, containers known as slack barrels are also used. These barrels come in two sizes, having 30″ and 34″ staves, the larger ones being employed for glue. About 150,000 barrels of each size were pressed into service last year.

"These slack barrels are built in our own cooper shop at the Union Stock Yards in Chicago. About 250,000 lard half-barrels are also turned out there annually. Slack cooper shops are operated at most of the other packing plants of the company, stock for these containers being bought on the open markets and practically the entire output of a large Minnesota company is required each year. This company manufactures pails and tubs, drawing on the basswood, birch, pine and other Minnesota woods for the material. In these containers are shipped lard, pork, casings, dressed meat, pigs' feet, soap, jelly, sausage, tripe and similar packinghouse products. Lard pails holding from one to fifty pounds are manufactured in the Chicago plant having a capacity of 60,000 of these pails a day."

Another of our largest shippers of provisions, in writing of the different packages in which the company's products are exported, calls attention to cut on page 568, representing a tierce or large barrel in which pure lard, lard compound or oils may be shipped. This is made of carefully selected oak, is free as possible from seed or worm holes, and is protected at the ends with galvanized iron hoops well driven and fastened so that they cannot slip with the shrinkage of the package, which they are quite certain to do if exposed to dry heat, with consequent serious leakage.

Barrels used in the exporting of pickled meat, that is, meat in brine, include half barrels, barrels and tierces, are illustrated in cut on page 568. The wood is carefully selected and the hoops are of galvanized iron to secure protection in long journeys to interior tropical countries of South America.

Some European importers have complained of certain American shipments of lard in wooden pails where the rims of the pails project and in consequence rub against each other and covers are frequently loosened or even lost. It is recommended that the practice of the larger packers be followed, that is, that the cover be nailed inside the outer rim of the pail.

Oils in Barrels.—A prominent exporter of cotton oil writes: "All of our oils for export are packed in hardwood iron-bound barrels. In normal times we are able to guarantee out-turn weights within 1 per cent, and could do it today were it not for the fact that owing to congestion in certain European ports ships have been held up indefinitely or the oil allowed to lie on the wharves for weeks at a time before consignee could take possession of same. This has been a war condition which has caused us to withdraw any guarantee of out-turn weights, but with the return to normal conditions we are of the opinion that by using the same care that we have heretofore in the selection of our cooperage that we can again guarantee out-turn weights. Very much depends on the manner of stowing the oil on the ship, and when we have a shipment of any importance we endeavor to have one of our men supervise, for our own protection, the stowing of the oil."

Another exporter of cotton oil says that: "The large percentage of cotton seed oil shipped abroad goes in strong, hardwood, export barrels which carry the oil safely to destination; and, as this package has been used with satisfaction to all concerned for many years, there remains very little to be said about it. These barrels are made of thoroughly seasoned white oak, iron bound, and contain about 375 to 380 pounds net, weight about 450 pounds gross, and measure about 12 cubic feet.

"We can also ship in any size barrel required or can ship the oil in tins of any style or size either plain or decorated. We also put our oil up in the French style of bottles, quarts, pints, and half pints, packing any number to the case that may be required."

European importers of American cotton seed oil have recommended that care be taken to prevent too much absorption of the oil by the barrels, through leaving contents too long in the containers or through the use of shooks which are too new or of too soft wood. Top covers of barrels containing all sorts of oils, cotton seed oil as well as mineral oil, sometimes dry up and crack during the voyage, and leakage results.

A shipper writes in regard to sundry oils: "Our standard package for shipments of coal tar oils and benzol is a 110-gallon drum, weighing about 175 pounds for the package itself and measuring 31″ maximum diameter by 41″ maximum height. In special cases we sometimes ship wooden barrels and once in a great while we employ two 5-gallon cans to a special export case, but in general, as above stated, the standard 110-gallon size drum is the package we employ on such shipments."

Flour in Barrels.—Flour exported in barrels is shipped in a variety of very different containers depending upon the market of destination, but even more upon the wishes and instructions of the customers. The various barrels used by one of the largest exporters of

flour, as shown in cut on page 535, include the following: Half barrels with four wire and four flat hoops; half barrels with ten flat hoops; half barrels with ten hickory hoops. Barrels are made with twelve flat hoops, with four wire and four flat hoops, or sometimes with twelve hickory hoops. This flour exporter declares that he has no knowledge of why his customers in some instances prefer one kind of barrel and in other instances another kind. He follows instructions in regard to all the kinds of barrels enumerated as suitable for export purposes. However, it is to be noted that some of the barrels shown in the photograph supplied (see page 535) have reenforced heads, others no such additional protection. If that protection is required in one instance, it would seem that it might be desirable in all instances.

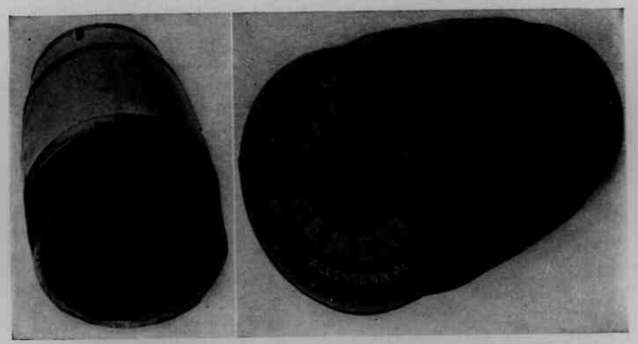
A large New York concern shipping flour chiefly to Europe urges that all flour barrels be lined with paper and have a double lining at top and bottom. Only in this way, it is stated, can satisfactory shipment be ensured.

Portland Cement in Barrels.—The American practice in exporting cement is to ship in barrels, although the common British practice involves almost exclusively shipments in bags, and it is worthy of note that the British cement enjoys a tremendous sale throughout the world, exceeding the volume of American exports of these products many times over. This fact certainly does not arise from any considerably cheaper first costs of cement in the United Kingdom than in the United States, and what part of it may be due to superior British shipping facilities or what effect on delivery costs shipment in bags rather than barrels may have, are questions which American shippers might study with advantage. It is a well known fact that superior shipping facilities from Great Britain, at least as they existed prior to the great war, enabled British exporters frequently to forward cement at insignificant freight costs, when it was possible to find steamers for a desired destination which happened to be short of cargo and were willing to take cement in bags as ballast at very low freight rates.

Courtesy of Edison Portland Cement Co.

METHOD OF PACKING CEMENT.

Special export package devised by this firm. Note that staves of barrel have been removed and cement is standing without support. Dead air space is entirely eliminated.



Courtesy of Lehigh Portland Cement Co.

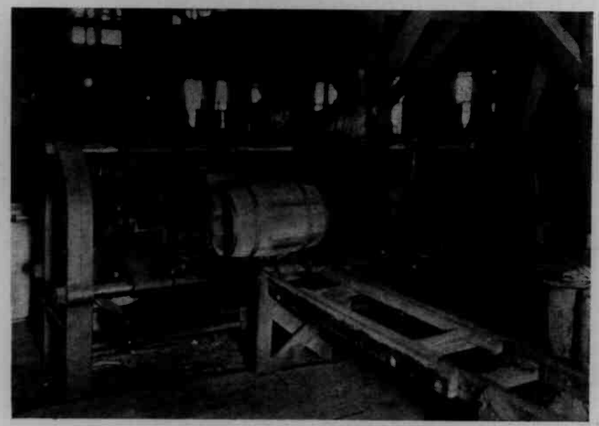
BARRELS USED FOR CEMENT SHIPMENT.

(Left) Staves are tongued and grooved. Barrels reënforced with steel hoops and lined with waterproof paper. (Right) Note method of reënforcing head of barrel.

Courtesy of Atlas Portland Cement Co.

CONSTRUCTION OF BARREL.

Shows use of barrel-raising machine. Staves are set up in circular form and head placed in form at bottom. Top is drawn together by wire frame and head hoops adjusted, then barrel is placed over heater.



Courtesy of Atlas Portland Cement Co.

METHOD OF TIGHTENING BARREL HOOPS.

Shows trussing machine which automatically drives hoops into place and tightens barrel.

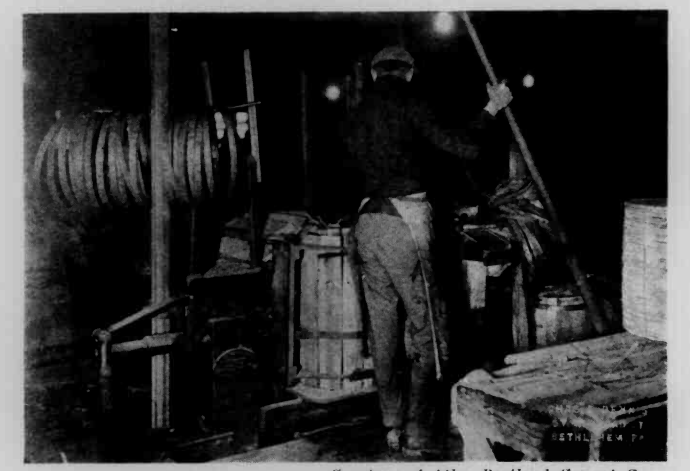
The reports of the Department of Commerce, of the United States, show that in 1919 there were exported some 2,463,689 barrels of hydraulic cement valued at $7,516,019. At present, exports of American hydraulic cement are chiefly to Latin America, but the writer knows of certain aggressive plans now being carried out by manufacturers that will doubtless increase very materially the export volume of this commodity.

A cement manufacturing company, prominent in export shipping, sends a photograph of a special export package which it has devised for its own shipments (see cut page 573) and calls attention to the fact that the staves of the barrel have been removed and that the cement is standing without support, this being due to the fact that dead air space has been entirely eliminated, reducing the possibility of breakage of the barrel to a minimum. The cement on the top of the barrel has been loosened with the finger which shows that this process of compacting does not cause the cement to cake.

Before the package illustrated was determined on a most elaborate series of experiments were made with barrels filled with cement, and these experiments covered the travels of the barrel, from the time it left the mill until the cement was removed for construction purposes in some distant country. All the shocks, strains, drops, vibrations, knocks and jolts of loading into the freight car; the handling incident to lightering, including the severe drop from the sling to the vessel's hold; the movement of the barrels during the ocean voyage as well as the unloading at the port of destination and transportation from that point, were carefully investigated.

From the correspondence in the above case, it is evident that the method of compressed packing followed has produced satisfactory results. However, other prominent shippers and manufacturers of cement are satisfied to send their goods abroad by filling the barrels in the usual way, merely tapping the barrel in order to settle the contents. This method seems to give equally satisfactory results.

INTENTIONAL SECOND EXPOSURE



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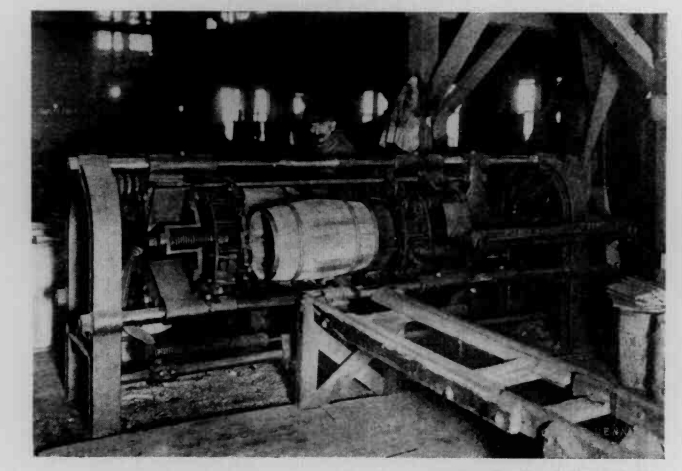

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Another large company writes: "We believe we have perfected a barrel which assures, under normal conditions, safe transportation to destination.

"We have erected, solely for the benefit of our foreign trade, our own cooperage plant which is equipped with the most efficient machinery made for the manufacture of cement barrels. By this process the staves are tongued and grooved and the barrels heavily reënforced with steel hoops, while additional reënforcements are provided for the head. Every barrel is carefully lined with waterproof paper so that the cement is protected against any possible damage from moisture while in transit. (See cuts page 573.)

"In shipping Portland cement you can readily understand the necessity for perfect packing. Cement is ground so fine that a minimum of 78 per cent must go through a 200-mesh screen, with 40,000 holes to the square inch. This makes a product almost finer than water and unless our barrels are in good shape, it would naturally mean sifting, breaking and a dissatisfied customer at the other end.

"We purchase sawed oak staves one-half inch thick, and prior to their entering the cooperage they are kiln dried. The duration of drying is entirely dependent upon the condition of the staves at the time they are being prepared for use. After leaving the kiln the staves are carefully inspected and only such material as passes a most rigid inspection enters the cooperage. These staves are then put through the various machines, first cutting to lengths, second slotting the ends to provide for the barrel heads, trimming the edges, placing tongues and grooves along the edge of each stave, etc.

"We purchase 15½" yellow pine heads one-half inch thick, cut and beveled ready for use. Our hoop material is received in rolls and at our own cooperage the material is cut to lengths, punched, riveted and stretched to conform to the bilge of the barrel.

"The staves are set up in a form around the barrel bottom and are drawn together by means of a cable after

which temporary hoops are placed over each end. The barrels are then placed over a slow coal fire heating drum which gives their permanent shape. From the drums the barrels go to the heading machine where the heads are placed. The permanent hoops follow and are driven into place by machine, right after which the barrels are delivered to the nailing machine where the hoops are secured in position. The finished barrels then go to the labeling and stenciling department after careful inspection, and are then delivered to the filling department where the head is removed, the barrel lined with a glazed waterproof paper, filled and reheaded.

"This is, of course, a brief description, but gives the main processes entered into in our cooperage plant where we have a capacity of 5,000 barrels a day."

A third large exporter sends photographs (see pages 574, 579), and writes: "In the manufacture of barrels for our cement there are used from 16 to 18 wooden staves, depending upon the width, of one-half inch thickness, heading 16" in diameter, and all barrels are hooped with four steel hoops. The heads are reënforced by head stiffeners, or what are known as export strips.

"In the manufacture of these barrels, the staves, when received in carload lots, are placed in large dryers and thoroughly dried. This requires from several days to a week, depending on the condition of the staves when received.

"After drying, all staves are taken to the cooper shops and put through crozing machines which chamfer the ends and cut the grooves which hold the heads in place. They are then delivered to the setting up or raising machines, where they are made up in barrel shape in the following manner:

"The staves are set up in a circular form and a head is placed in the form at the bottom. The top is then drawn together by means of a wire frame and the head hoops placed around it, after which the barrel is placed over a heater which keeps the barrel in shape and helps to further dry it.

"From the heater, the barrels are sent to the tappers who slip two bilge hoops thereon. These tappers also examine the barrels to see if there are any broken staves, knot holes or other defects, and if any are detected the barrels are returned to the setting up machines for replacement.

"After inspection the barrels are run through the trussing machines, where the hoops are automatically driven in place, and the barrel is made tight. Here again any barrels that develop any defects are thrown out.

"Beyond this machine are the trimmers who place the export strip on the outside of the end of the barrel which is headed. This export strip is nailed in place and further strengthened by a piece of angle iron on each end which extends over the edge and is thoroughly nailed.

"In this condition the barrels are transferred to the packing houses to be filled with cement, after which the second head is put in place and another export strip fastened in a similar manner to the one previously put on. Here also head liners are nailed in place and all marking for shipment is done. Our standard barrels are absolutely uniform in size and the quality is as near perfect as is possible to make them, rigid inspection being enforced at all times."

Iron and Steel Products in Barrels and Kegs.—A typical example of export shipment of iron and steel products is found in the large foreign business which manufacturers of wire nails enjoy. A large shipper states: "We use a lining of heavy waterproof tar paper which protects the nails from moisture. We put a steel cleat on the top and bottom of the keg. This makes a very substantial packing and the complaints of broken packages are nil." (See cut page 579.)

A house making a specialty of the manufacture of wire products gives the following data in reference to its export shipment: Steel wire nails are packed in strong wooden kegs lined with pitch paper and bound securely with special steel hoops. All kegs have steel cleats on the ends as an additional protection against damage by

Courtesy of Atlas Portland Cement Co.

COMPLETED CEMENT BARREL.

Constructed of 16 to 18 wooden staves, ½" thick, heading 16" in diameter. All barrels are reënforced with 4 steel hoops, and head stiffeners.

Courtesy of Pittsburgh Steel Co.

PACKING OF WIRE NAILS.

Steel wire nails are packed in strong wooden kegs lined with pitch paper and bound securely with special steel hoops. Kegs have steel cleats on ends as additional protection against damage by rough handling during transhipment.

Courtesy of Col. J. N. Wolfson.

RESULTS OF POOR PACKING.

Kegs containing bolts and nuts weighing two to three pounds each, the bands of the kegs being missing on arrival at Manila.

Courtesy of E. R. Squibb and Sons.

DRUGS AND CHEMICALS IN BARRELS.

An export drum, light in weight but very firm, containing 100 lbs. of boric acid powder. Note strong paper lining.

rough handling during transhipment. The kegs contain nails usually weighing 100 pounds, 112 pounds and 133⅓ pounds net. Nails are also furnished in kegs weighing from 45 to 99 pounds net, or in cardboard lined jute canvas bags weighing 56 pounds or 112 pounds each, gross weight. However, kegs and bags of special weight can also be furnished.

Blued lath nails are packed in kegs which are carefully lined with special antiseptic paper. This insures the receipt of the nails by the consumer in the same perfectly sanitary condition in which these sterilized nails leave the mills. Lathers and others who carry nails in their mouths are thus protected, as the nails are kept free from all injurious substances from the moment of their complete sterilization until the keg is opened by the consumer.

Complaints of foreign buyers of American wire nails are chiefly directed against the use of kegs of too light weight, which sometimes burst in transit; and perhaps criticism is even more frequent of the insecurity of the fastening of the heads of the kegs which are quite often broken.

A prominent manufacturer of chain always ships his products up to 1-inch in heavy oil barrels well coopered. Another manufacturer, when shipping in barrels, always lines them with waterproof paper and sprinkles over the chain a non-hydrating product in order to prevent rust in transit. When heavy commodity like chain is shipped in barrels, care should be taken to use small sizes of barrels when shipping to the West Coast of South America or other points where landing facilities are not of the best.

Wire finer than No. 30 gauge, tinned wire, lacquer finish or light coppered and annealed wire are usually packed in strong barrels made from gum staves, reënforced with wire hoops and special cleats on each head for additional protection. The barrels are lined with heavy tarred paper; then strong packing or kraft paper, each coil of wire being paper wrapped.

Merchandise to the value of $25,000 to $30,000 was

recently reported as lying unclaimed in the custom house at Manila because arriving without means of identification owing to the mutilation or destruction of frail containers. Note in the accompanying photograph (page 580) several kegs which contain bolts and nuts weighing two to three pounds each, bands of the kegs being missing and the heads broken.

A large New York exporter shipping to the Dutch East Indies comments on shipments of bolts, nuts and rivets in barrels which are too light for their contents. He believes that this sort of merchandise should be shipped in packages weighing not more than 200 pounds, and in barrels, because of the great extra charge for shipments in boxes.

A New York firm shipping to Japan complains that shipments of box strapping have been received packed 600 pounds in a light sugar barrel. This firm states that it is hardly possible to roll a sugar barrel containing this weight of steel across a room without practically destroying the container. It is easy to imagine, therefore, the condition of such a shipment after being handled three or four times, particularly in the loading slings of an ocean carrier. Only the heaviest hardwood barrels are strong enough for 600 pounds of contents.

An exporter gives the following details of his shipments: "We make large quantities of spring steel which we furnish in coils wound ribbon fashion, each coil weighing approximately 60 to 80 pounds. This material is oiled, wrapped in paper and then packed in oil barrels, as we have found that oil barrels make the best package for export; for a box, no matter how strongly it is reënforced, if dropped from a wagon on the corner, will come apart. Furthermore, a box is frequently made of green wood and when put into the hold of the vessel becomes damp and often rusts the steel, whereas the oil barrels are made of heavy oak, properly dried and seasoned, and on account of having contained oil are more nearly rustproof than any package we know of and they are furthermore very strong. We can pack in each barrel about a

thousand pounds and the barrel can be rolled and therefore handled much easier than a box weighing considerably less."

In connection with shipments of such commodities, the following specifications issued by the General Engineer Depot of the United States Army are to be noted: "Hardware, nails, bolts, etc., should be packed in small cases or kegs made of first class material with heads reënforced by double heads, flush with the chime, with grain in the heads at right angles, well nailed together, banded with not less than four straps ⅝"x .015 inch, secured in place by removing the two outer hoops, drawing the straps down and fastening them beyond the two hoops, after which the two hoops are replaced and secured in position.

"Alternatively, the heads shall be secured by small strips of wood around the edge, called 'head lining,' a steel cleat, meeting the approval of the Depot, crossing the grain of the head and supporting it, such cleat to have ends extending under the end band and well down the sides and well secured."

"Where practicable the weight of the keg and its contents shall be under 125 pounds.

"For steel products, oil barrels, or equal, shall be used.

"Wood filling will fill the end level with the chime and support it, its direction shall be across the board of the head. Inside the head a second head shall be placed, 1¾" thick, its boards extending at right angles to the boards of the head. The heads shall be carefully secured to the sides, at least three bands 1" x .030 inch will cross the head and be secured under two hoops at each end and to the sides.

Sundry Products in Barrels.—Manufacturers of drugs and chemicals ship such powdered materials as boric acid in light but very strong export drums, so-called, which are really straight-sided barrels. In such cases a strong paper lining is used, as illustrated in photograph reproduced on page 580.

Other chemicals shipped in barrels include, for example, acetic acid, shipped in barrels usually weighing about 490 pounds gross, 78 pounds tare, 412 pounds net, measurements being 21½″ head, 25″ bilge and 34″ height.

Soda ash is packed in barrels having elm and gum staves, hardwood heads, and steel and iron hoops, lined with crinkly paper bags with heads reënforced by a strip of hard pine across the heads and strapped on with steel straps. It is also sometimes shipped in bags.

All dry acids, aniline dyes, potash and, in general, chemicals in the dry state when shipped in barrels or casks, should be protected by linings of strong tough paper.

What are sometimes called rough products shipped in barrels include glucose, where expansion of the contents and consequent leakage is to be guarded against by especially strong hoops. Rosin barrels ought to be stronger than they sometimes are and special attention given to the heading. Old barrels ought not to be used for rosin and some attention ought to be paid to the use of lighter barrels than those sometimes employed, in view of complaints received of excessive tare on this American product in comparison with rosin received from other sources. Complaint is also made of the shipment of American plaster to Australia, the barrels often not being sufficiently strong and arriving in bad condition. In shipments of tobacco it has been observed that the wood employed was hastily dried, making it quite brittle, and as the contents are heavy it is not surprising that barrels frequently reach destinations in damaged condition. More hoops and of a better grade may profitably be employed and special attention given to the heading up of the barrels.

Cut glass is usually packed in barrels because it is so heavy. To contain the contents of a barrel weighing 26 pounds a box weighing about 60 pounds is necessary. Furthermore, a manufacturer argues, the danger of breakage is less when barrels are used because they are easier to handle, and because if dropped there is only one

Courtesy of Geo. Borgfeldt & Co.

METHOD OF PACKING CUT GLASS.

Packed in barrels because of its weight. Danger of breakage is less than if packed in case since if barrel is dropped there is only point of contact with ground. Barrels are tipped for ease in packing by tilting in box containing slanting board as rest.

Courtesy of Joseph Dixon Crucible Co.

PACKING OF FLAKE GRAPHITE.

Barrels are first lined with double paper lining, after which graphite is put in and paper folded over top. Top of barrel is put on and double cross heads as shown are nailed on both top and bottom. Straps of barrel hoop iron are bound around barrel and over cross heads.

INTENTIONAL SECOND EXPOSURE

Other chemicals shipped in barrels include, for example, acetic acid, shipped in barrels usually weighing about 490 pounds gross, 78 pounds tare, 412 pounds net, measurements being 21½″ head, 25″ bilge and 34″ height.

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Packed in barrels because of its weight. Danger of breakage is less than if packed in case since if barrel is dropped there is only point of contact with ground. Barrels are tipped for case in packing by tilting in box containing slanting board as rest.

Courtesy of Joseph Dixon Crucible Co.

PACKING OF FLAKE GRAPHITE.

Barrels are first lined with double paper lining, after which graphite is put in and paper folded over top. Top of barrel is put on and double cross heads as shown are nailed on both top and bottom. Straps of barrel hoop iron are bound around barrel and over cross heads.

Courtesy of Joseph Dixon Crucible Co.

PACKING OF GRAPHITE CRUCIBLES.

Nested in thick cushions of oat straw, which possesses maximum spring. Straw is carefully tamped down.

Courtesy of Joseph Dixon Crucible Co.

PACKING OF GRAPHITE FACINGS.

The general method of packing is similar to that used in packing flake graphite.

point of contact with the ground instead of many. For ease in packing, barrels are tilted into a box containing a slanting board, which acts as a rest, as illustrated in photograph on page 585.

It is needless to remark that the very greatest care should be taken in packing any kind of glassware to see that hay, straw or other packing materials perfectly separate each article and that a heavy cushion of such materials protects the contents from sides and heads of the barrels. China and crockery may be wrapped in tissue paper before being packed and, if very delicate, in corrugated paper sleeves before being imbedded in the cushioning material in barrels. In this general regard much fuller information will be found in the special chapter in this volume devoted to the packing of glass and fragile goods in general.

Incandescent electric lamps have been shipped by Dutch manufacturers in hogsheads containing from 400 to 500 lamps each. These were packed as follows: First a layer of straw was placed on the bottom of the cask; the lamps, enclosed in a corrugated sleeve and a paper wrapper, were placed on end; over them a light layer of straw and a corrugated board, then another layer of straw, another layer of lamps, and so on, the sides of the casks being lightly lined. In addition to the interior packing, a twisted straw rope was placed on each end of the cask to serve as a buffer and absorb shocks. The advantage of packing in hogsheads is believed to consist in the saving of considerable freight charges when large quantities are shipped, although it is confessed that Dutch packing is not so advantageous as American packing for rehandling and distributing to dealers in other countries.

A domestic practice which ought not to be carried into the export trade is found in the practices of some manufacturers of leather counters or stiffenings for shoes, which are shipped in barrels with one head only, the other being merely covered by a single or possibly a double thickness of burlap. This is not a satisfactory

method of shipping any products whatsoever by ocean steamship to foreign countries. There is the greatest danger of the burlap top being torn and contents being lost.

A large manufacturer of graphite products submits photographs showing packing in barrels which appear on pages 585, 586. One of these is a barrel containing flake graphite. The barrel is first lined with double paper lining, the graphite put in and paper folded over the top of the contents; the barrel is reënforced with double cross-heads, nailed top and bottom, over which and around the barrel extend straps of hoop iron. Another photograph shows graphite crucibles packed in hogsheads, very carefully nested in thick cushions of oat straw, which is found to have more spring in it and to afford much better protection against breakage. This straw packing is tamped down and made very solid. Yet another photograph supplied by this manufacturer shows a barrel containing graphite facings. It is double lined with paper and the heads are protected with double cross-heads reënforced with strap iron.

Specifications for Barrel Containers.—The following regulations prescribed by the Interstate Commerce Commission for shipments in bulk in wooden barrels, half barrels and kegs, while designed to apply to domestic shipments of inflammable liquids, may yet be recommended as generally desirable practice for all kinds of liquids for export shipments:

"Material from which the barrel, half barrel, or keg is constructed must be oak, or other suitable hardwood, thoroughly kiln dried; provided that kegs of a capacity not greater than 18 gallons may be constructed of soft wood if the thickness of staves and heads is one-eighth of an inch greater than that required for the oak kegs.

"The staves and heads must be not less than the following thickness when the barrel, half barrel, or keg is finished:

"For barrels (capacity over 32 gallons and not over 55 gallons), 11/16 inch.

"For half barrels and kegs (capacity over 18 gallons and not over 32 gallons), ⅝ inch.

"For kegs (capacity 5 gallons and not over 18 gallons), 9/16 inch.

"For kegs (capacity under 5 gallons), ½ inch.

"The hoops must not be less in number nor smaller in size than the following: For barrels (capacity over 32 gallons and not over 55 gallons), six hoops: Head hoops, 1 11/16 inches by 17 gauge; quarter hoops, 1 7/16 inches by 18 gauge; bilge hoops, 1 11/16 inches by 17 gauge.

"For half barrels and kegs (capacity over 18 gallons and not over 32 gallons), six hoops: Head hoops, 1½ inches by 19 gauge; other hoops, 1¼ inches by 19 gauge.

"For kegs (capacity 5 gallons and not over 18 gallons), six hoops: Head hoops, 1¼ inches by 19 gauge; other hoops, 1⅛ inches by 19 gauge.

"For kegs (capacity under 5 gallons), four hoops: Head hoops, 1 inch by 20 gauge; other hoops, ⅞ inch by 21 gauge.

"Bungholes and other openings must be provided with secure closing devices that will not permit leakage through them. Compressed, tapered wooden bungs must be covered with a suitable coating and must have a driving fit into a tapered hole. They should be soaked in hot water for about one minute before driving into the bunghole.

"The barrels, half barrels and kegs must be coated on the inside with glue, asphaltum, or other coating suitable to prevention of leakage of the contents. When glued, there must be used at least two coats of good commercial glue so as to insure a uniform covering of the inside surface and averaging in total at least one-half pound to each barrel, and for half barrels and kegs an amount proportional to their inside surfaces.

"Barrels, half barrels and kegs which have been used at least once must be thoroughly recoopered when necessary, and must be reglued with at least one coat of glue before each refilling. Badly bulged or warped heads must be replaced.

"All slack barrels, half barrels, and kegs are divided into classes limited both as to capacity and weight of contents as follows:

"Class A. Capacity not over 10 gallons, and to contain not over 100 pounds net weight.

"Class B. Capacity not more than 17 gallons, and to contain not over 150 pounds net weight. The average container of this class is the ordinary 12½ by 18 inches keg.

"Class C. Capacity not more than 25 gallons, and to contain not over 200 pounds net weight. The average container of this class is the ordinary half flour barrel, 13½ by 24 inches.

"Class D. Capacity not more than 35 gallons, and to contain not over 400 pounds net weight. The average container of this class is the ordinary flour barrel, 17⅛ by 28 inches.

"Class E. Capacity not more than 45 gallons, and to contain not over 600 pounds net weight. The average container of this class is the ordinary sugar barrel, 19⅛ by 30 inches.

"Class F. Capacity not more than 55 gallons, and to contain not over 750 pounds net weight. The average container of this class is practically the ordinary oil barrel, 20½ by 34 inches.

"The material from which the barrels, half barrels, and kegs are constructed must be of good hardwood (except when specifically provided otherwise), thoroughly kiln dried, and must be free from knots.

"The staves must be not less than the following thickness: Hardwood—Classes A, B and C, six staves to 2 inches (cut or sawed); Classes D and E, ⅜ inch each (cut) or five staves to 1⅞ inches (sawed); Class F, 7/16 inch.

"Softwood—Classes A and B, 7/16 inch; Classes C, D, E and F, softwood not allowed.

"The heads must be not less than the following thickness: Oak, beech, maple, and red gum, 7/16 inch for all classes; basswood, cottonwood, tupelo gum, and other similar woods, ½ inch for all classes. Softwood: 9/16 inch for classes A and B. Softwood not allowed for heads of classes C, D, E and F. The heads of classes D, E and F must be cleated or battened across the cants with cleats not less than 4 by ½ inch.

"The hoops shall not be less in number than the following. Wooden hoops: six hoops for classes A and B; eight hoops for classes C and D; twelve hoops for classes E and F. Steel hoops: four hoops for classes A, B, C and D; six hoops for classes E and F. The hoops shall not be smaller in size than the following: Wooden hoops —thickness 5/16 to 3/16 inch and width 1⅜ inches, inside measurement, for all classes. Steel hoops—For classes A and B, head hoops 1⅜ inches by 23 gauge; bilge hoops 1⅜ inches by 23 gauge; for classes C and D, head hoops, 1⅝ inches by 21 gauge; bilge hoops 1⅜ inches by 23 gauge; for classes E and F, head hoops 1⅝ inches by 21 gauge; bilge hoops 1⅜ inches by 23 gauge; quarter hoops, 1⅜ inches by 23 gauge. Gauge mentioned refers to United States standard.

"If desired, half of the wooden hoops may be replaced by steel wire hoops, the wire to be directly under the wooden hoops (between the hoop and the bilge) and to be not less than No. 11 gauge for classes A, B, C and D, and not less than No. 9 for classes E and F.

"If desired, the standard wooden hoops may be replaced by oval bark hoops (so-called half-round), three circumferences of which will be required to take the place of one standard hoop.

"If the Brainerd steel hoop is used, the rolled edge shall be included in measuring the width of the hoops.

"All steel hoops must be nailed or bradded in place, except wire hoops, which must be stapled, and all wooden hoops must be nailed or stapled in place with at least four nails, brads, or staples in classes A, B, C and D, and six nails, brads, or staples in classes E and F.

"The ends of wooden hoops must be joined with at least one staple clinched on the outside and with at least two additional nails or staples clinched on the inside.

"Both heads must be headed up in the usual manner before shipment and must not be closed by gunny sacking, boarding, or other like methods.

"The heads must fit into a croze or notch in the staves and in addition there must be an outer lining hoop to hold the heads in place. These lining hoops must extend entirely around the inside of the chime and must be held in place by nails at intervals of about 5 inches.

"For paper bags, used as inner containers for kegs, the paper must be crimped or crêped parallel to the axis of the bag. The crimping must be such that the crimped paper will stretch at least 25 per cent of the original length without tearing.

"The crimped paper must have a tensile strength not less than 32 pounds parallel to the crimp, and not less than 28 pounds across the crimp. These tests to be made on strips 3 inches long and 1 inch wide.

"The crimped paper must be impervious to water at a temperature of 80° F. Tests of imperviousness to be made by folding the paper into cones as for filtering purposes. The cones are filled with water at 80° F. to a depth of 2 inches; no water must come through the cone during a period of 24 hours.

"The bags must be made with seams turned over not less than ¾ inch. The seams must be stitched midway between the inner and outer edges. The length of the stitches must not exceed ⅓ inch.

"The bags must be of sufficient diameter to fit sides of kegs without stretching.

"The bags must be of sufficient length, so that when placed in keg and filled to capacity of keg and the end of the bag closed by tying, there will be not less than 3 inches length above the tie."

CHAPTER XXII

EXPORT SHIPMENTS IN BAGS, BUNDLES AND WITHOUT PACKING

IN this chapter we have for brief consideration several forms of export shipments which may not at first seem to require any special study, and are essentially different in many respects from shipments in cases, crates or bales. However, shipments in bags or bundles, and even shipments that are sent overseas without any packing whatsoever—that is, bare or naked shipments, as they are variously distinguished—do involve certain considerations which should require study. First of all, in such shipments, as in any other, there is the natural desire of every shipper that his merchandise arrive in the hands of his foreign customers safely and in the best possible condition. No matter what forms shipments may take, it has always to be remembered that they will undergo many different handlings before they reach the point of destination overseas. Protection given must be adequate to accomplish this result of safe and sound delivery, and also sufficient to insure delivery with a minimum loss of contents of bags or bundles. Moreover, the method adopted must insure the arrival, intact, of units or combinations of units which may be shipped naked, and their deliveries to the prospective consignees.

Shipments in Bags

Many different commodities included in the commerce of the world are customarily shipped in bags, including, for example, flour, corn meal, rice, seeds, sugar, coffee, rubber, jute, cork, fertilizers, bone meal, cottonseed meal, corn cake, beans, peas and similar vegetables, asbestos, china clay, soda ash and some other chemicals, etc.

The first consideration affecting shipments in bags is the quality and texture of the material used for the sacking. This obviously must depend to a large extent upon the value of the contents. Certainly American cotton bags have won an enviable reputation throughout the world, and are most highly prized by other countries for overseas shipments. The bags themselves are imported in large quantities from the United States—very especially by countries exporting valuable seeds, for example. However, the price of the bags under discussion is such that they are not commonly regarded as possible containers for commodities of low or even of average values. In shipping many low-grade commodities it is necessary sometimes to employ second-hand and even patched bags, but when this is done care should be exercised to select for any one shipment only those bags having as nearly as possible a uniform appearance. It is often necessary for foreign buyers to re-sack products received from overseas, because of the dirty and unsalable condition in which bags are received. So doing does not contribute to the importer's good temper or to his kindly feeling toward American shippers. And, then, too, constant chafing inevitably involved in the course of a sea voyage must always be remembered, and the frequent rehandling of goods shipped in no matter what containers. It has been reported from Porto Rico, for example, in regard to shipments of flour to that island, that the average shipment is handled by carriers at least four times, and very often twice four times, before arriving at destination.

Texture of Bagging Important.—The texture of the bagging employed is frequently important, for probably considerably more than one-half of all claims made on shippers for short weights are traceable to the sifting of the contents of bags placed in old or loosely woven sacking. Meal, flour, grain, rice, seeds and similar commodities shipped in old bags of coarse texture almost always involve rather serious losses from sifting. It has been estimated that waste in many shipments amounts to from

2 per cent to 5 per cent, largely or chiefly because of sifting from loosely woven bags; therefore the tissue of the bagging should be well woven, but nevertheless it must not be stiff or hard, but, on the other hand, elastic and supple, to conform readily to the contents.

Losses claimed on arrival weights, when not due to sifting because of the loose texture of bags, are almost always to be traced to the poor sewing of bags. One critic complains that in sewing up bags it is too often the custom to begin three or four inches from each side ear, with the result that when the sewer loosens the sack, gaps develop in the space left between the first stitch and the ear, out of which the contents are bound to work. It is advised that the first stitch should be taken not over one inch from the ear. However, there are not always two ears left on the bag; frequently there is one only, and that in the center. Irish importers of flour and meal have suggested that the tops of sacks be sewed more closely, and with more stitches, and that the ear be not placed too near the center of the top. The ears are often used as handles, and the bags are less liable to burst when the ear is on the side than when it is placed in the center.

Use of Double Bags.—Damage to bags from the use of longshoremen's hooks is evidently to be expected and is probably unavoidable. Partly on this account, double bags are frequently to be advised, in order that if the outer bag be torn by hooks or by rough handling the inner bag will still protect the contents. Another reason for the employment of double bags, applying especially to shipments of flour, is that the inner sack will be preserved in a fairly clean condition by the exterior sack, and therefore that the merchandise will arrive in suitable condition for immediate resale. Inner bags may be sometimes of paper, sometimes of cotton, sometimes of jute—dependent upon the commodity shipped—whether, for example, fine wheat flour or common vegetables—paper linings frequently being employed inside the burlap bags in the shipment of soda ash.

One of the largest American exporters of flour, in speaking of shipments of that commodity in bags or sacks, states that a great variety of such containers is employed according to the requirements and conditions of different foreign countries or of sundry foreign importers. Flour is sometimes packed in 20-pound cotton sacks, 98-pound Osnaburg sacks, 49-pound cotton sacks, 140-pound jute sacks, 200-pound Osnaburg sacks, 97-pound drill sacks, 196-pound Osnaburg sacks, 132-pound drill sacks. Cotton sacks employed for the small bags sometimes demanded, include 7-pound, 24½-pound oblong and 24½-pound square, 12-pound, 25-pound and 40-pound containers. Cotton sacks holding 126 pounds are also employed with an outer sack of jute. The largest and more or less regular sacks are usually employed when no particular requirements are given by customers. The small bags are grouped in bundles and packed in burlap. The larger sacks are shipped as they are (see cut, page 535).

Osnaburg is regarded as the most desirable material for flour bags of the common shipping weight of 200 pounds. Lighter materials have not proven satisfactory for such weights. A large shipper states that corn meal is exported in 98-pound cotton sacks and 196-pound Osnaburg cotton bags. The meal is kiln dried before being shipped.

Wrong Use of Bags.—Bags have sometimes mistakenly been used for the shipment of all sorts of commodities for which they ought never to be employed. For example, from Manila it is reported that not long ago a lot of railway spikes were shipped to that port in quantities of several hundred pounds in a flimsy jute sack. The natural and inevitable result was that the sacks arrived all torn and gaping, with a fairly large percentage of their contents missing. Reference has been made, in the chapter in this volume devoted to shipments in barrels, to the customary English practice of shipping Portland cement in bags. That practice may easily be understood, while the queer twist in a shipper's mind which would induce him to dispatch two or three hundred

pounds of iron spikes in a bag is not comprehensible. Commodities for which bags are suitable overseas shipping containers may easily be distinguished by mere superficial study of the principles of ocean freighting.

Proper marking and addressing of shipments in bags requires very careful attention, in order that marks may not be obliterated, worn off, or in any way lost or made unreadable upon arrival in foreign ports. Such marking is, however, similar in all respects to the marking of bales, which will be found discussed at length in other pages of this volume.

Shipments in Bundles

Under the heading of "Bundles" there must be included several more or less dissimilar ways of shipping; for example, here we have merchandise which is merely wrapped in burlap or some similar material, making what are sometimes rather loosely referred to as bales, but which are to be distinguished from bales, properly so-called, which term ought to be restricted to compressed merchandise; nor can bundles be classified under the heading of "Bags," which term should be restricted to shipments such as those just above described. Moreover, in addition to burlaped bundles, we have shipments of numerous commodities tied up in bundles with rope or with wire, and shipped without other protection, or with slight protection, which is not intended to be of a permanent character, or which may never arrive at destination.

When shipping goods for export in bundles, absolutely no protection is given the merchandise, as a prominent New York export merchant points out in a letter, and therefore only those articles which are practically indestructible should ever be forwarded in this manner.

General remarks applying to the packing of all sorts of goods refer equally to the shipments in bundles, but especial stress should be placed on the following features

of such shipping. Marks or addresses must be of such a character that the bundles will reach the right consignees without question or debate. No tags should be employed which are merely tied to a bundle in the forlorn hope that they might still remain attached when destination is reached. Remarks applying to addressing of bales apply equally to bundles which are covered with burlap. When bundles have no outside wrapping, the addresses should be stenciled, if possible, on the merchandise itself, or other distinguishing marks employed to which reference will shortly be made under the head of "Bare or Naked Shipments." Great care must be exercised in the tying together of articles into bundles. A New York export merchant emphasizes this in writing: "Bundles should be tied very securely so that one piece cannot slip out, and so cause the undoing of the entire bundle." Many complaints are received as to the use of old rope or twine in fastening together bundles which, in such instances, often arrive in miscellaneous bulk condition and not in the original shipping state. Wire or iron bands should preferably be used, twisted, or drawn very tight when small articles are shipped, such, for example, as barrel staves. The usual bands around the circumference of the bundle may advantageously be supplemented with other bands running lengthwise, to prevent the dropping out of some of the interior contents and thus loosening the entire bundle in the course of the many handlings which such shipments, like any overseas shipments, necessarily receive. If rope or twine is employed, liberal use of it should be made, each round carefully, tightly and individually knotted. The very slight extra expense required is well worth while. All bundles should, of course, be so made as to occupy the least possible cubic space, the only exception to be recognized being certain shipments in bundles of rather fragile merchandise which requires packing or cushioning with excelsior, grass or straw, the safe arrival of the contents being of even greater importance than the saving of cubic space.

Furniture in Bundles.—Writing to the author regarding his practice in export shipping, a manufacturer states: "Furniture is sometimes packed for export in bundles, especially when shipped to countries in which duties are assessed on the basis of gross weights—that is to say, chiefly to some of the Latin American countries—and in these cases extraordinary precautions are usually taken to protect the goods both from damage and with adequate waterproofing materials. Burlap of suitable quality is usually laid out, spread with excelsior to a depth of five or six inches or more (according to the article that is to be packed), then is brought up around and over the furniture and sewed tightly. Bundling is advisable only for nearby countries, or when the article of furniture can be completely knocked down or is so inexpensive that the price of a case would be disproportionate to its value, or where duties are paid on the basis of gross weight. Tarpaulins should be used inside of the burlaps, or sometimes oiled paper instead of tarpaulins, for adequate protection against rain storms and other damage from moisture."

Not only are some comparatively simple pieces of furniture bundled for export, but the practice has even been extended to the export shipments of iron safes. In both cases, one of the important safeguards to be adopted is the protection of the legs of pieces of furniture—wardrobes, for example—and the wheels which are usually attached to American but not to European safes. If it is impossible to demount legs or wheels, as ought always to be done, extreme care must be shown in their protection, bracing employed if necessary and the very thick cushioning which should protect all surfaces of contents of bundles of this description must be many times increased for the protection of such projecting parts as legs or wheels. The obvious risk of damage from hooks in any shipments in bundles must be carefully considered when furniture or anything of that sort is shipped. Moreover, it is quite clear that any such shipments in bundles cannot be expected to travel through to destination right side up. Bundles are likely to be loaded and stowed on their sides

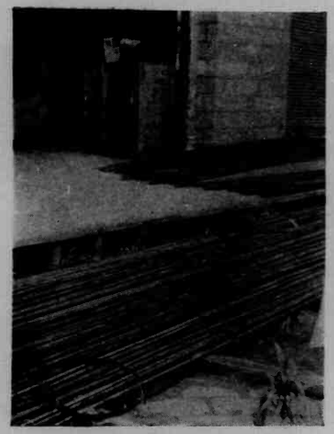
or on their heads, or in any haphazard fashion; and furthermore, especially as applying to bundled pieces of furniture, there is the very great danger of crushing from superimposed packages, some of which may be very heavy indeed.

Automobile Tires Bundled.—One manufacturer says that solid tires are baled separately, each tire by itself, and shipped in this form baled with a good grade of burlap.

Another manufacturer submits photographs showing solid truck tires, the boxing of which is very expensive, while the slight damage which might be incurred, if burlapped, is so small that it does not pay to box the tires. Therefore, tires are wrapped as shown in a photograph on page 601, and then five tires are bound together as further illustrated, and finally all surrounded by suitable burlap protection.

Another manufacturer says that he frequently uses bundles for the shipping of automobile tires when customs regulations of certain countries make so doing advisable. The tires are shipped in bundles of from four to six tires, the tubes being deflated and placed inside of the bundle, which is wrapped securely with burlap—generally a sort of white compound waterproof paper and burlap, which allows the mark to be seen readily. In shipping to Chile, bundles are made small for convenience of transportation in that country.

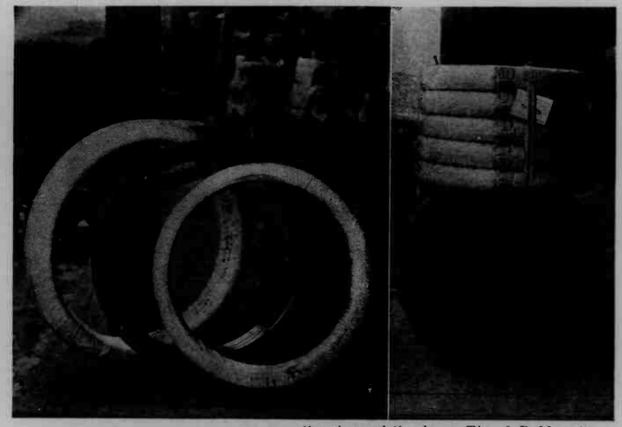
Bundles of Shovels, Handles, Etc.—A manufacturer of shovels packs his products both in cases and in burlap bundles. When in bundles, usually one dozen shovels are carefully tied together with wire and then wrapped in burlap, as shown in cuts page 420. It may be suggested that to the critic it appears that the burlap wrapping, as shown, is almost certain to be torn and in shreds, if not entirely missing, by the time these bundles arrive at destination, with the possible consequence that marks and addresses have disappeared. An improvement would seem to be suitable tying with rope or wire to secure the burlap wrapping, and making it fit snugly to the con-



Courtesy of Col. J. N. Wolfson.

UNIDENTIFIED SHIPMENT OF IRON BARS.

Shows bar iron received at Manila without evidence of packing marks or brands.



Courtesy of Goodyear Tire & Rubber Co.

METHOD OF PACKING TIRES.

(Left) Two of the solid truck tires shown are wrapped in burlap ready for shipment. (Right) Illustrates method of tying tires prior to baling. Note marking on completed bale.

INTENTIONAL SECOND EXPOSURE

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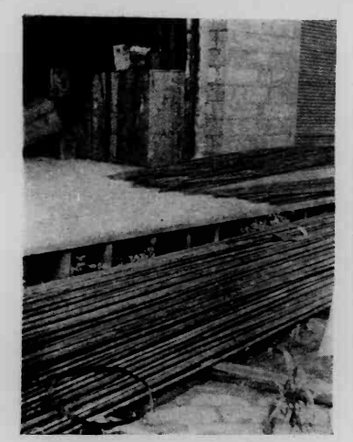

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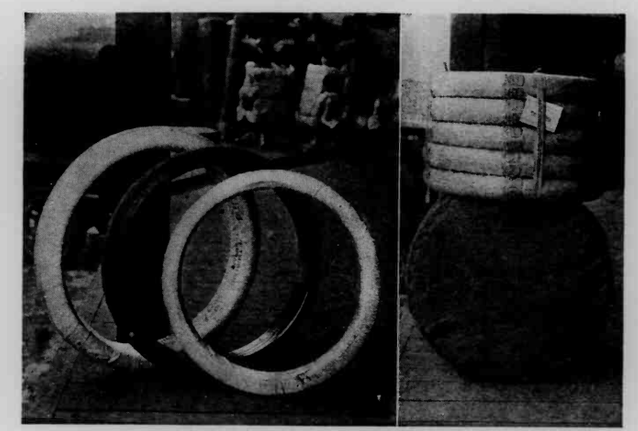

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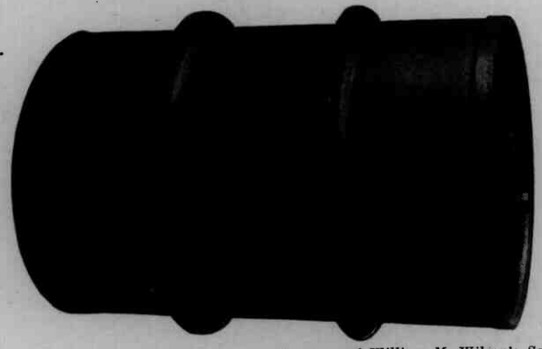
METHOD OF PACKING TIRES.

(Left) Two of the solid truck tires shown are wrapped in burlap ready for shipment. (Right) Illustrates method of tying tires prior to baling. Note marking on completed bale.

Courtesy of Mesta Machine Co.

SHIPMENTS OF LARGE MACHINERY.

Protection is afforded by strips of wood as shown in photograph.



Courtesy of William M. Wilson's Sons.

DRUM FOR EXPORT SHIPMENT.

For detailed comment on use of types of drums for various commodities see text.

tents, otherwise protection desired from the burlap would in many shipments be altogether lost.

The specifications for packing issued by the General Engineer Depot, United States Army, provide: "Shovels will be shipped in bundles of six, securely wired together with annealed wire of not less than No. 12 B.W.G. The bowls will be nested, the handles wired in two tiers of three each."

A report from Mexico recently received compliments American packing of shovels, in which great improvement has been shown in recent years over the old twine-bound bundles which usually arrived with units scattered. Strong burlap, well sewed, is now employed, bound with twisted iron wires, or tightly drawn iron strapping.

One house, doing an international business in handles, writes: "We frequently pack handles for some of our export trade in heavy burlap bags, well tied with two or three-ply sisal rope," although more frequently this house ships in closed cases.

Bundled Picture Mouldings.—Picture mouldings are sometimes packed in bundles instead of in cases, when it is desirable to minimize the gross weight in some Latin American countries, particularly Venezuela, where import duties are on the basis of gross weight of the package. Properly picture mouldings ought to be packed in cases for adequate protection. However, a large manufacturer writes that in case of necessity, for shipping to markets just referred to: "We tie up enough moulding to make a bundle about 12 inches in diameter, around this for protection tying heavy cushions of excelsior covering the entire length. The whole is then covered with a heavy rubberized waterproof paper of three-ply thickness, to keep out dampness. The entire bundle is then sewed up in burlap and strapped with wire, making a gross weight of about 135 pounds. This has been pronounced a very satisfactory method of such shipping."

Staves, Hoops and Lumber in Bundles.—Small parcels of lumber, especially in the finer hardwoods, are usually

forwarded in bundles, and require no special consideration, except for the necessity of tying up firmly and tightly, yet with such protection to the corners of the bundles that the abutting pieces of lumber will not be cut by the wires or bands and rendered unsalable, and always with due precautions against the slipping out of pieces of lumber from the interior of the bundle. Care also should be exercised to pack together, so far as possible, pieces of one length and width, in order to guard against the breaking of the ends of long pieces and the splitting of wide pieces in the course of the voyage.

From Liverpool it is stated that there is general ground for complaint as to the manner at present adopted in the United States of packing or bundling staves, headings and hoops. Heading for export should be pressed tighter than usual; and in cases where only two wires are generally employed, at least four should be used. The method recommended most highly is that of using bundling iron; that is, iron strips about one-half inch in width. Some of this that proves most effective has a corrugated edge, which absolutely prevents slipping. When this is employed only two pieces will be necessary, one piece being nailed on the bottom and passed entirely around, and the other piece being nailed on the top and being passed around the bundle likewise. Wooden cleats laid across the top and bottom head of the bundle, together with iron straps, also prove very satisfactory for heading. A very simple precaution in packing staves, but one that repays the extra expense manifold, is that of connecting the usual ties at both ends with a third one running lengthwise of the bundle. Hoops generally arrive in pretty fair condition, it is said, and if they are done up in bundles of 10 coils each and a little extra care is used in the tying, and a little more twine used, they will probably carry in good condition.

Hickory squares are packed in bundles and carry best if bound with wire. If poorly tied, pieces slip out when moved so that from 25 per cent to 30 per cent land in bulk. Bundles of staves and shooks are often poorly tied

with cord. Wire-bound bundles generally carry well.

An export house writes to the author: "In most cases our staves are shipped loose, except in the case of sawn staves which are usually bundled for convenience of handling; especially where staves weigh less than 2 pounds we always bundle them to avoid loss in transit.

"In shipping barrels for export, they are usually knocked down, the staves bundled by themselves, and the heading and hoops are packed in a set-up barrel, so that a given number of bundles, together with one barrel containing sufficient heading and hoops constitute a given number of complete packages.

"There is no definite standard method of packing cooperage material, and on export business it is always the custom to conform to the ideas of the buyers."

Another shipper of staves states that the practice with them is to ship staves loose or in bundles tied with wire or strap iron. This house does not case or crate the staves.

Iron and Steel Products in Bundles.—A prominent manufacturer and exporter advises the author as to the company's export shipments in the following language: "The rolling mills in this country that are interested in export business usually bundle bars in very small packages, presumably because they have not the necessary crane facilities to enable them to handle larger packages. Their bundles usually run from about 250 pounds to 300 pounds, and as most bars shipped for export are at least 30 feet in length, this means that the bundles contain very few bars. As a result, the packages are not sufficiently stiff to withstand the handling to which they are subjected in loading to and from steamers, such shipments frequently arriving at destination with the bars very badly bent, involving extra expense to the customer in straightening the bars before placing them in stock.

"Our experience of a good many years indicates that, depending upon the size and length of the bars, the packages should run from a minimum of about 1,000 pounds up to 1,600 pounds, or sometimes as much as 2,000 pounds. If proper care is used in nesting the bars and

in putting on the ties, this size package will insure great stiffness.

"It is our practice to use wire ties of slightly less than ¼" diameter, spaced 1 foot from either end of the bundle with intermediate ties, usually 30", but never more than 36", on centers. These wire ties are in turn wired with smaller wire to at least two of the outside bars in the bundle so that, if the package changes shape due to rough handling or the piling of heavy cargo on top of it, the ties cannot slip out of position. Considerable care is necessary in tightening up the wire ties because, if they are twisted too tight, the wire becomes crystalline and will break under any heavy strain.

"There are some ports where the ships unload into lighters, where the stevedores will deliberately break open these packages because of their objection to handling the heavy bundles from the lighter to the dock, but even in such cases the shipments will reach destination in much better condition because most of the rough handling occurs in loading to and from the ship.

"We would be very much interested in seeing all bar shipments for export bundled more or less in the above manner, as we think it would have a beneficial effect on American steel export trade generally.

"The bundles of bars are tagged with tin tags manufactured by our company. These tags are embossed with the shipping marks of consignee. Some of our customers also request that the ends of bars be painted with a specified color, so that the goods may be identified in case tags are lost. Each bundle has at least two tin tags."

Another large exporter writes as follows: "Steel wire is put up in coils weighing from approximately 125 pounds to 155 pounds; also in coils weighing approximately 65 to 80 pounds. These are so-called 'catch weight' or 'split catch-weight' coils. 'Exact weight coils' weigh from 11 pounds up. Coils are shipped bare or oiled, or wrapped in paper or burlap, or both, and forwarded in single coils, or in bundles of two, nested and tied together, or several coils tied together.

"Fence wire is put up in catch-weight, split catch-weight or even weight bundles, in ordinary round coils, square bundles, two round coils nested, or two or more coils wired together. This wire is shipped bare. The wire is tagged with a linen or tin tag.

"Barbed wire is put up on either single or double cross piece wooden reels and shipped in this way. These reels vary from 25 to 125 pounds net weight, and are shipped bare. When the wire is transported by mule it is sometimes burlapped, to protect the animal.

"Two-strand twisted cable, or barbless fencing wire, is packed on wooden reels, like barbed wire, in catch weight reels, being tagged in the same way as fence wire.

"Wire fencing is shipped bare in rolls of various lengths."

The following practice is in use by a third large shipper: "Bars in small sizes are put up in bundles, the bundles tagged, and large sizes are shipped loose. Occasional bars are tagged. The ends of all loose bars have an identifying paint mark.

"Sheets, both plain and corrugated, are shipped in bundles, in skeleton unlined crates, in skeleton felt lined crates, and occasionally, but rarely, in boxes. All of the marks necessary can be put on the crates, bundles or boxes.

"Barbed wire is put up on reels or spools of the weights specified by customer. The spools are suitably tagged and without covering. Reels of other wire may be shipped in burlap."

Specifications for packing of the General Engineer Depot of the United States Army provide that "steel pipe, when less than 2 inches in diameter, shall be bundled with not less than No. 12 B. W. G. annealed wire into bundles of preferably less than 200 pounds. Threads will be slushed and provided with a metal thread protector."

A report received from South America reads: "Galvanized wire in sizes as fine as No. 25 gauge is almost always packed in specified weight bundles wrapped in burlap. Sometimes customers demand paper wrapping

as well as burlapping, but an experienced shipper believes that any galvanized wire heavier than No. 25 gauge does not necessarily require paper wrapping in addition to burlapping. Wire in finer sizes, from Nos. 25 to 30 gauge, packed in specified weight bundles, should always be wrapped in paper in addition to the burlap. South American markets sometimes require wire in bundles, sometimes packed in barrels."

Electrical wire is generally shipped in rolls, but the usual roll might be made much more compact, thus taking up much less cubic space and arriving in better condition. Paper ought not to be used as wrapping, for burlap will ensure arrival in much neater and more salable condition.

A large New York exporter doing business with Japan is of the opinion that such material as band iron and box strapping should be wrapped in burlap in bundles weighing about 200 pounds, and if likely to corrode the material should be first wrapped in hardware paper and then burlap. If one coil of strapping or wire or similar material is not heavy enough to make about 200 pounds, then two bundles may be strapped together. This house points out that there is a great saving in space, by bundling the material in this manner, over the practice sometimes adopted of shipping in barrels.

A manufacturer of that product states that insulated wire is packed in coils, protected by waterproof paper and burlap.

"Bare" or "Naked" Shipments

Since no export packing of any description is employed in the overseas forwarding of commodities here to be classified, which are shipped without packing or protection of any description, or slight, if any, protection, it might on first thought seem that no attention need be given in these pages to such shipments. However, there is one very important matter which, from innumerable complaints that are received, should be given a good deal more thought than would appear to have been devoted to

the subject heretofore. This refers to the adequate marking of many such shipments, or a specific indication of some sort applied to each article shipped bare which will ensure the arrival of each such article in the hands of the legitimate consignee. Innumerable complaints are received from importers in other countries of the arrival of iron and steel products—bars, rods, rails, etc.—without identifying marks, with consequent serious losses to importers. For example, observe the reproduction of photograph (page 601) supplied by Colonel Joseph N. Wolfson, of Manila, illustrating losses incurred at that port through the arrival of merchandise which cannot be identified. This is a photograph of quite a quantity of bar iron, which arrived at Manila "without the slightest evidence of packing marks or brands." Apparently a good many American shippers pay no attention at all to the application of identifying marks to loose goods shipped bare, while others adopt very haphazard methods of marking such goods. For example, one shipper writes as follows: "Pig iron, as a rule, is shipped without any marks, but if several different kinds are forwarded in the same vessel, buckets of different colors of paint are sometimes poured over the various piles." It would seem to the critic that a stripe or splash of paint applied with a brush individually to each pig would cost practically nothing, and would be a much surer means of identifying the consignee, different consignees in the same port having, of course, each his own distinguishing color. As a matter of fact, the use of paint of distinguishing colors seems about the only practical and economical fashion of indicating consignees of merchandise of this description which is shipped loose; very especially when rods, bars, etc., are of comparatively small sizes or diameters, to which it may be physically impossible to affix stenciled or other similar consignee marks in full. The paint marks in question are usually applied at the ends of the bars or rails, or whatever the commodity may be. This, however, is a practice which heretofore seems to have been more honored in the breach than in the observance.

Indeed, some shippers do not seem to have appreciated the really serious losses which have been incurred by foreign consignees, one large shipper actually going so far, in a conversation with the author, as to remark: "A 15-foot bar, even in small sizes, is not an object easily lost." The answer is that they *are* frequently lost. This same shipper expressed his disbelief in claims advanced on account of such losses, although there can be no doubt at all about the good faith, substantiated in many instances by photographs, of the customers of American shippers who have complained in this respect.

Wherever possible, full stenciled marks, always made with thoroughly waterproof paint of such a description that it will not easily be rubbed or blurred, should be invariably employed, as, for example, in shipments of steel pieces, and in shipments of such other articles often forwarded bare or without protection, as boilers, very large pieces of machinery, etc.

Large Machinery.—Two considerations generally inspire the shipment in bare or unprotected condition of large pieces of machinery. First and chief of which is the usually rough character of the piece being shipped, which ordinarily is intrinsically proof against the usual shipping risks. The second and minor consideration is that even when there are fragile or more or less delicate parts of the piece, they may be more tenderly treated if shipped bare and with the dangerous points easily visible, than might be the case if very carefully boxed and hidden. It may usually be taken as probable, at least, that large and very heavy pieces will be handled with some care and consideration by stevedores, and receive the personal attention of ships' officers, partly because of the power required in hoisting heavy pieces, and partly because of the care required in properly adjusting slings to guard against damage to the deck or even the bottom of a ship, should a heavy piece break loose from the slings and fall a considerable distance. Instances have been known where a very heavy piece, thus escaping from its fastenings, has plunged through the hatchways of a ship, and

broken a hole right through the ship's bottom which required thousands of dollars of expense in drydocking and repairing.

In the shipments of large pieces of machinery, or anything of that description, care must of course be taken for the protection against rust or other damage of bright parts, by thorough slushing in the fashion usually prescribed for machinery in general, as elsewhere in this volume fully described. Skids frequently have to be employed for the mounting of such pieces, in order to facilitate their moving on rollers along wharves or across the floors of warehouses. In this connection reference may be made to photograph (reproduced on page 371) illustrating the manner in which a large condenser is prepared for export shipment, when supporting saddles or feet are not cast integral with the shell. Attached shafting, crank shafts or axles, in the case of large flywheels, etc., should usually be protected by strips of wood, as will be noted in the reproduction of a photograph appearing on page 602. See further in this general connection remarks appearing in the chapter devoted to bulky shipments under the head of locomotives.

Chains.—A prominent manufacturer and exporter states that chain larger than 1" is shipped loose, without packing of any description; also smaller sizes are usually packed in wooden cases, or in oil barrels. This manufacturer does not state what, if any, protection is given the larger sizes against danger of rusting, but if, as is often if not usually the case, the chain is shipped for re-sale—that is, shipped to merchants rather than to users—then its arrival in bright, salable condition would seem to require adequate protection against this risk.

Official Specifications.—In connection with shipments of merchandise bare or without packing, the specifications of the General Engineer Depot of the United States Army provide as follows: "Boilers.—Where there are no protuberances likely to be injured the depot may authorize shipment without crating; in this case the marking will be put upon the metal. Tanks, boilers and

similar material, where subject to damage if uncrated, will be shipped on skids or cradles, secured thereto by bands of ample strength provided with a turn buckle or satisfactory substitute; they shall be blocked against longitudinal shifting; the skids or cradles will present no sharp edges to the loads.

"Heavy and large tractor or flywheels will generally be shipped without crating or boxing. Hubs will be carefully protected, if necessary.

"Rails will be shipped bare; splice bars preferably in pairs bolted together with their own bolts; fittings for rails preferably in boxes.

"Unfabricated rolled beams, channels, angles, tees and similar material, including plates, not less than 3/16 inch thick, will be shipped bare.

"Wire fence material will be made into tight rolls and securely wired, with wires about 6 inches from each end and not over 36 inches apart, not crated.

"Fabricated structural steel will generally be shipped bare. Each piece will be marked as directed. Where projecting parts are likely to be injured, such blocking as will protect them will be placed, unless held unnecessary."

CHAPTER XXIII

EXPORT SHIPMENTS IN DRUMS AND CARBOYS

THE average American manufacturer of products shipped in drums is usually interested mainly in the quality of the product and he frequently gives the package too little consideration. However, it is obvious that the rôle played by the package is of such importance that every effort should be made to provide a suitable container. The manufacturer, in ordering his cans or drums, should be most careful first to secure every bit of information at hand in reference to the particular shipment, to consider the nature of the material with which the container is to be filled, to understand conditions at point of destination, and so on.

A prominent manufacturer of steel containers offers the following remarks on packages of this sort:

"In the selection of a package for export work, we take into consideration the specific gravity of the material to be shipped, the destination, the number of handlings, and the market for used drums at the port of final destination. We do not recommend for any export work a package lighter than 16 gauge in the 55-gallon size or 14 gauge in the 110-gallon size, and for anything longer than transatlantic shipments, we recommend a package with separately applied rolling hoops. We herewith send you a photograph of a standard container (see page 602).

"For sulphuric and other corrosive acids and materials having a gravity over 1, for consumption in England and territories adjacent to the larger continental ports, we recommend all 14 gauge with separately applied rolling hoops in the 55-gallon size, and all 12 gauge with separately applied rolling hoops in the 110-gallon size. These specifications also apply for any commodity shipped to Asiatic ports, but to the West Coast of South

America, and ports in Africa other than Mediterranean ports, we suggest the use of the lighter drums. The reasons are obvious.

"In England and the manufacturing districts on the Continent of Europe, there is a good market for second hand packages, which have recently been selling for more than the cost of new packages in this country. Therefore, it is economical to purchase a package which will better than any other withstand the wear and tear of transportation, and consequently present a higher salvage value on arrival. This also applies to shipments to Asiatic ports and to the Mediterranean coast, where there is a steady flow of vegetable oils from these territories back to the United States. In the case of Africa, with the exception of the Mediterranean ports, and the East Coast of South America, however, the consuming centers are very largely located inland, and here the additional weight of the heavier package is a factor worthy of serious consideration, especially in view of the fact that there is no great demand for packages of this type for either local consumption or export.

"Of course, it is to be expected that the American manufacturer will not be very keenly interested in the re-sale value of the package once it arrives at destination, as he, generally speaking, charges his foreign buyer with the original cost of the package plus a slight profit, but indirectly we feel that this is an important feature, as his foreign buyer is undoubtedly better pleased if he receives a package which has a high re-sale value than if he receives a package the salvage value of which is practically negligible.

"To recapitulate, we can generally recommend all 12 gauge in the 110-gallon drum and all 14 gauge in the 55-gallon drum for export to England, Continental Europe, Asia, the West Indies and the East Coast of South America, and all 14 gauge in the 110-gallon drum and all 16 gauge in the 55-gallon drum to Africa, other than Mediterranean ports, and West Coast of South America. For specific shipments, where for good and

sufficient reasons the re-sale value is not considered, we recommend, for shipments to England and Continental Europe, the 55-gallon drum without separately applied rolling hoops, but we do not believe that in any case packages of a lighter gauge than those specified should be used."

Specifications for packing issued by the General Engineer Depot of the United States Army provided that 50-gallon steel drums used for shipping liquids in general be of not less than .0625" in thickness.

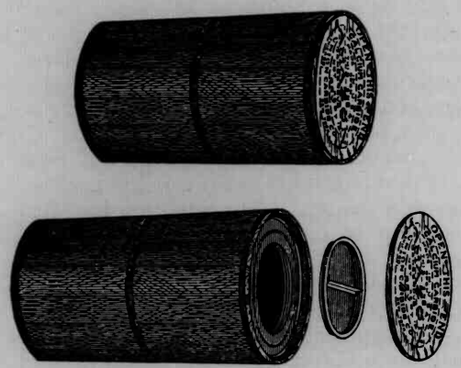
Caustic Soda.—A photograph (see page 619) was recently sent us of a shipment of caustic soda in drums which arrived at destination in very bad shape and was the source of grave injury to several stevedores. In this case the drum was manufactured of very light material, as is too commonly the case, and while the solid mass of the soda provided good support for the light metal against crushing strains the package was readily punctured. These punctures easily admitted water which in turn dissolved the acid, and a condition was created which could not but be dangerous for any one handling the package.

Caustic soda seems to be packed by various manufacturers in different sizes of containers but always in steel drums. A prominent exporter of caustic soda writes that his caustic soda is packed in steel drums of the following sizes and dimensions: In packages having a net weight of 675 pounds the drums are made of 24 gauge sheet steel stock with the heads rolled or spun in. The caps are rolled in; 720 pounds, 25 gauge body and heads, 4½-inch rolled in cap; 708 pounds, 22 to 24 gauge; 760 pounds, standard U. S. gauge, body 24, head 24, caps 26; 725 pounds, 26 gauge iron fitted with 9-inch friction plug; 700 pounds, 24 gauge, 5-inch friction cap in top; 750 pounds, 23 gauge body and head, 8-inch cap; 750 pounds, 24 gauge, 5-inch friction cap in one head; 730 pounds, 25 gauge sheet steel.

Another exporter of caustic soda writes: "Our caustic soda packing is in uniform drums of the following

weights: Gross 740 pounds, net 720 pounds; gross 229 pounds, net 220 pounds; gross 105 pounds, net 100 pounds."

A third exporter of caustic soda says that, "caustic soda for export is packed in various sized containers and various manufacturers have a different method of packing. Our packages are made of steel drums in three sizes, as follows: Small, 112 pounds net, 119 pounds gross, space occupied 2.11 cubic feet; medium, 221 pounds net, 230 pounds gross, space occupied 2.91 cubic feet; large,



Courtesy of Union Carbide Sales Co.

675 pounds net, 695 pounds gross, space occupied 7.77 cubic feet. All of our drums are filled to exact weight, hence with the tare weight known, it is very easy to determine the exact amount of caustic soda in each drum."

Calcium Carbide.—A large shipper of calcium carbide writes: "The necessity of secure packing on calcium carbide shipped by water is of extreme importance and places a double obligation on the manufacturers of this commodity.

"Calcium carbide, as you perhaps know, is very susceptible to moisture and when brought in contact with

same releases acetylene gas. It is obligatory, therefore, that our export packages shall be so constructed as to absolutely prevent the contents from coming in contact with moisture, and also to make them sufficiently strong to withstand the rough handling incidental to long ocean voyages.

"A great many years ago we designed a special package for the water shipment of carbide consisting of a heavy sheet steel drum, the seams of which are double lock-jointed (no solder being used on the package), the opening being fitted with a gasketed screw cover, over which a metal false cover is placed, and the entire metal package is then encased in a heavy wooden overcask. (See photograph page 616.)

"From the fact that carbide so packed by us—shipments amounting to many thousand tons per year—is received at destinations such as Argentina, Chile, Peru, Africa, Australia, the Philippines, China or India, in first class condition and that we have still to receive our first legitimate complaint of damage to the contents of an export package, we feel that we have accomplished all that is possible in the way of protecting our material, and to some extent in 'lifting the curse' off American packing abroad."

Printers' Ink.—A great many different commodities are shipped in drums, including oils, paints, sundry liquids and semi-liquids. In a general way, all such packages may be considered similar and may be illustrated by photographs which have been supplied of drums used in shipping printers' ink.

Printers' ink, packed in quantities larger than 50-pound pails, is generally shipped in steel drums, according to advices received from a prominent manufacturer of this commodity. Of these drums (see photograph, page 619), three sizes are used, 15-gallon, 30-gallon and 55-gallon. These are manufactured of No. 18 gauge steel with No. 16 gauge heads, with rolling hoops rolled into the shell, making a very sturdy and satisfactory package. Printers' ink is also sometimes shipped in steel pails

which, for present purposes, may be considered under the general heading of drums, the steel pails used, as shown in the illustration (page 620), containing either 25 or 50 pounds. Attention is called by the manufacturer to the following points: (1) the sturdy construction of the steel pails and the secure way in which the cover is fastened on; (2) very legible stenciling on the pails; (3) the aluminum tag which is attached to each pail and which carries the batch grinding number.

Acids.—The shipment of acids is thus described by a correspondent: "We ship carboys entirely boxed, in fact, there are two boxes, one covering the body and a small case covering the neck and head.

"On mineral acids, further protection is secured by using sealing wax over the stopper. With nitric acid we use sufficient mineral wool to prevent fire or damage to other goods.

"Whereas it might be true that the American method of packing has not in every instance been of the best, nevertheless, the writer feels that a mountain is sometimes made out of a mole-hill and that undue criticism and exaggeration are made of a natural business error, or for causes beyond our control."

Another exporter of acids writes: "Our mineral acids for export are sold in glass carboys which are boxed for export shipment, the weights and measurements being as follows: Gross 246 pounds, tare 57 pounds.

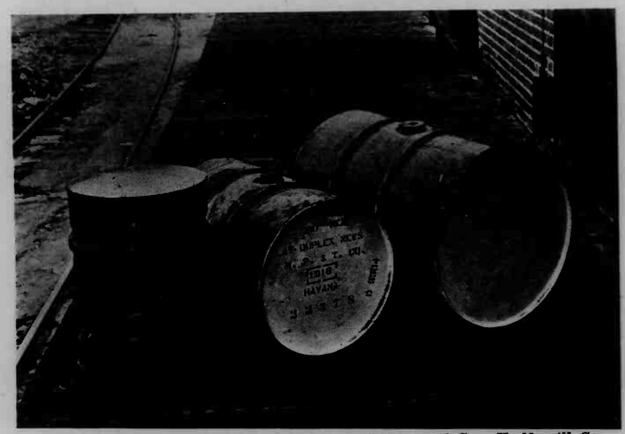
"These carboys, when used for export, include square tops, the measurements being 17¼ inches width including cleats, 15½ inches length, 31 inches height including the square tops."

Carbonic Acid Gas.—Steel cylinders are used in shipping carbonic acid gas, having a capacity of about 50 pounds. These cylinders are about 50 inches high by 8 inches in diameter and are shipped naked without any crating.

Specifications for Drums.—The Interstate Commerce Commission regulations covering the specifications required in iron or steel barrels or drums for shipment of

EXAMPLE OF POOR PACKING OF CAUSTIC SODA.

Shows caustic soda shipped in container manufactured of very light material.



Courtesy of Geo. H. Morrill Co.

PACKING OF PRINTERS' INK.

Drums manufactured of 18 gauge steel, 16 gauge heads, with rolling hoops rolled into the shell.

INTENTIONAL SECOND EXPOSURE

which, for present purposes, may be considered under the general heading of drums, the steel pails used, as shown in the illustration (page 620), containing either 25 or 50 pounds. Attention is called by the manufacturer to the following points: (1) the sturdy construction of the steel pails and the secure way in which the cover is fastened on; (2) very legible stenciling on the pails; (3) the aluminum tag which is attached to each pail and which carries the batch grinding number.

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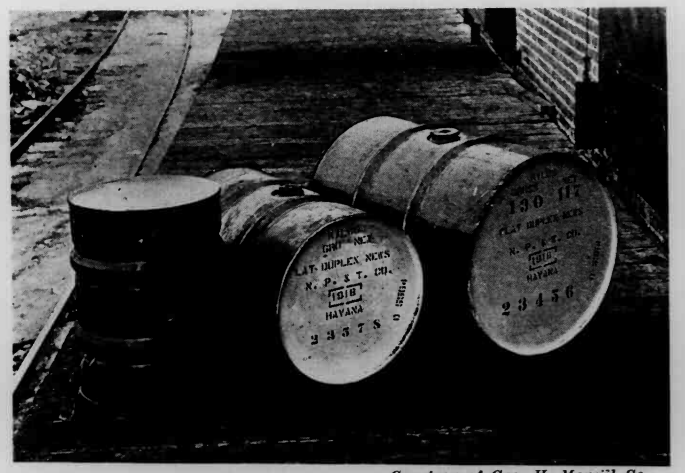
Carbonic Acid Gas.—Steel cylinders are used in shipping carbonic acid gas, having a capacity of about 50 pounds. These cylinders are about 50 inches high by 8 inches in diameter and are shipped naked without any crating.

Specifications for Drums.—The Interstate Commerce Commission regulations covering the specifications required in iron or steel barrels or drums for shipment of

EXAMPLE OF POOR PACKING OF CAUSTIC SODA.

Shows caustic soda shipped in container manufactured of very light material.



Courtesy of Geo. H. Morrill Co.

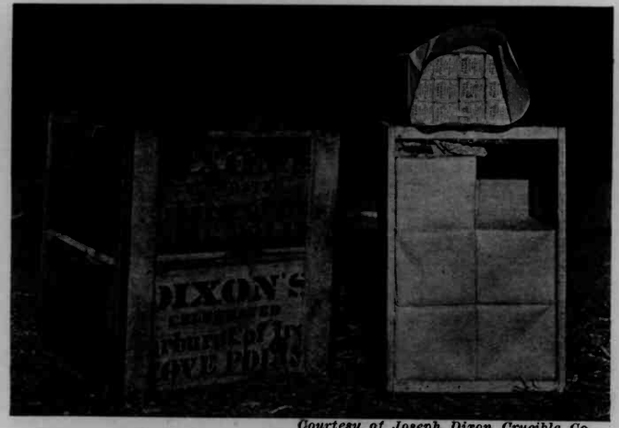
PACKING OF PRINTERS' INK.

Drums manufactured of 18 gauge steel, 16 gauge heads, with rolling hoops rolled into the shell.

Courtesy of Geo. H. Morrill Co.

STEEL PAILS FOR PRINTERS' INK.

Steel pails 25 and 50 pounds showing construction, stenciling and griding number tag.



Courtesy of Joseph Dixon Crucible Co.

PACKING OF STOVE POLISH.

Packages first wrapped in paper, then cased. Two cases are strapped together as shown. The combined cases are strapped with iron.

inflammable liquids, may very well be taken as a model to be followed by all shippers for export of every commodity for which drums are used. The following are extracts from the official regulations in question, full particulars of which are readily available from the Commission:

"It is recommended that, when nature of contents will permit, each such container should be coated on the inside and outside in such manner and with such material as will prevent corrosion.

"An iron or steel barrel or drum with a nominal capacity of over 55 gallons, but not over 110 gallons, must be constructed of metal the minimum thickness of which in any part of the completed barrel or drum must be not less than full No. 14 gauge, United States standard.

"The weight of a barrel or drum with a nominal capacity of 100 to 110 gallons must be not less than 130 pounds in the black exclusive of the rolling hoops.

"An iron or steel barrel or drum with a nominal capacity of over 35 gallons, but not over 55 gallons, must be constructed of metal the minimum thickness of which in any part of the completed barrel or drum must not be less than full No. 16 gauge, United States standard.

"The weight of a barrel or drum with a nominal capacity of 50 to 55 gallons must not be less than 70 pounds in the black exclusive of the rolling hoops.

"An iron or steel barrel or drum with a nominal capacity of over 10 gallons, but not over 35 gallons, must have a minimum thickness of metal in any part of the completed barrel or drum of not less than full No. 18 gauge, United States standard.

"An iron or steel barrel or drum with a nominal capacity of not more than 10 gallons must have a minimum thickness of metal in any part of the completed barrel or drum of not less than full No. 20 gauge, United States standard.

"Each barrel or drum must be tested under water or with all seams covered with soapsuds or heavy oil, by

interior compressed air at a pressure of not less than 15 pounds per square inch sustained for not less than two minutes, and must stand this test without leaking.

"The type of barrel or drum must be capable of standing without leaking a hydrostatic test pressure of not less than 40 pounds per square inch, sustained for not less than 5 minutes.

"When filled with water to 98 per cent of its capacity the type of barrel or drum must also be capable of standing without leakage a test by dropping it diagonally on its chime from a height of 4 feet upon a solid concrete foundation.

"Factory tests of the type package must be made with sufficient frequency to insure that the product complies with the above paragraphs.

"Provision must be made for closing the bungholes and other openings in such manner as to prevent leakage. Bungs or other closing devices projecting beyond the chime or rolling hoops must be capable of withstanding the same test drop as described by paragraph 9. Threaded metal plugs must be close fitting and threads in the reënforcements and on the plugs must be cut at right angles to the faced surfaces thereof to insure a uniform and solid bearing throughout the entire circumference of the gasket. Gaskets must be made of lead, fiber, leather, or other suitable material. Wooden bungs must be compressed, tapered bungs, and must be covered with a suitable coating and have a driving fit into a smooth bung hole tapered the same as the bung.

"Note:—The gaskets and the flange of the bung should be coated with gum shellac dissolved in alcohol to about the consistency of molasses and then the bung should be set down tight with a wrench having a handle at least 18 inches long. The barrel should then be allowed to stand on end for a few hours until the shellac dries, after which the barrel should be placed bung down to test for leakage before offering for shipment.

"Wooden bungs should be long enough to extend about 1/8 inch inside of the barrel and should be soaked

in hot water or hot, thin glue for about a minute before driving into the bung hole so that the interior of the bung will swell and form a shoulder on the inside of the bung hole.

"The method of manufacturing the barrel or drum and the materials used must be well adapted to producing a uniform product. Leaks caused by defective manufacture of a barrel or drum must not be stopped by soldering, but must be repaired by the method used in constructing the barrel or drum."

Carboys.—Similar specifications included in the regulations of the Interstate Commerce Commission apply to carboys of glass or earthenware, which must be employed in domestic shipments of inflammable or corrosive liquids and these, too, may be accepted as desirable practice applying to export shipments. Among these regulations the following paragraphs may be quoted:

"Any glass container with a nominal capacity not less than 10 gallons shall be classed as a carboy, and no carboy used for the shipment of acids or inflammable liquids shall have a nominal capacity of more than 13 gallons.

"A carboy with a capacity of 12 gallons must contain a minimum of 16 pounds of glass. A carboy with a capacity of 13 gallons must contain a minimum of 16¾ pounds of glass.

"Note:—The glass in the side walls of molded carboys should be as well distributed as practicable and the minimum thickness should be not less than 2/32 inch.

"Any clay or earthenware container of not less than 5 gallons (nominal capacity) shall be classed as a carboy. No clay or earthenware carboy shall have a (nominal) capacity of more than 13 gallons.

"The material in the bottom and side walls of clay or earthenware carboys shall be as evenly distributed as practicable and the minimum thickness shall not be less than 3/8 inch. The carboys shall be acid proof.

"The carboy must be closed (a) by having an earthenware or glass stopper inserted into the mouth of the

carboy, sealed in place by clay, plaster of Paris, or similar material in a plastic condition, and securely fastened with burlap or other suitable material drawn tight and securely tied under the lip of the mouth with strong cord; (b) by a glass or earthenware stopper with gasket, secured by metal fastenings; (c) by a glass or earthenware stopper ground to fit, secured by burlap or other suitable material; (d) if the contents of the carboy are not corrosive, by a cork or other similar closing device securely fastened in place to prevent leakage.

"The body of the carboy must be completely inclosed in a strong wooden box and so cushioned by proper packing material that the glass will not come in contact with the wooden or iron covering. (This requirement does not apply to the wooden or metal elastic strips used to cushion the carboy.)

"All wooden carboy boxes used as outside containers for carboys must comply with the following specifications:

"The material from which these boxes are made must be of good sound white pine or any wood of equal or superior strength. All lumber must be dry and well seasoned, and must not have loose knots in any part. Minimum thickness of lumber specified refers to the actual thickness in the finished boxes.

"The thickness of the top, bottom, ends, and sides must be not less than 7/8 inch.

"The four vertical edges must be reënforced in a suitable manner to secure strength and stiffness. For rectangular lead carboys this reënforcement is not required, but two of the sides must be of lumber not less than 1¼ inches in thickness.

"The box must be nailed with nails not smaller than 7-penny at approximately 2-inch centers or 8-penny nails at approximately 2½-inch centers. The sides and ends of the box must be nailed together and also to the reënforcing pieces.

"There must be two cleats not less than 7/8" x 1¾", one placed on each end of the box for carrying and two

cleats not less than 7/8" x 1¾" across the ends of the bottom of the box to act as shoes and to protect the bottom of the carboy.

"The cushioning support for all carboys must be such that the type of box, when containing the carboy filled with water to the lower edge of the neck and properly packed and cushioned, must be able to withstand the following tests:

"(a) By dropping on its bottom onto a concrete or brick floor from each of the heights of 6 inches, 12 inches, 18 inches, 24 inches, etc., in succession. Each box must withstand the first three drops without serious injury, and in testing not less than three packages the average maximum drop withstood by at least two of them without breakage of the carboy must not be less than 24 inches.

"(b) By suspending as a 14-foot pendulum and swinging against a concrete or brick wall with successive swings the vertical components of which are 6 inches, 9 inches, 12 inches, 15 inches, 18 inches, etc. Each box must withstand the first four blows without serious injury, and in testing not less than three packages the average maximum swing withstood by at least two of them without breakage of the carboy must be a swing with a vertical component of not less than 12 inches.

"Note:—For carboys cushioned with hay or similar material the space between the sides of the carboy and the box should be about 1½ inches."

Steel Cylinders for Gases.—"Cylinders used for the shipment of any gas, not liquefied, and not in solution, whose charging pressure does not exceed 300 pounds per square inch, at 70° F., must comply with the following specifications: (a) Cylinders must be made of basic open hearth steel. (b) Chemical analysis: carbon .06 to .20 per cent; phosphorus not to exceed .04 per cent; sulphur not to exceed .05 per cent. The chemical analysis must be verified by check analyses made on samples taken from one out of each order or lot of 200 or less plates, shells or tubes from which the cylinders are to be made. One analysis from any one heat of steel is sufficient.

"All seamless cylinders must be uniformly and properly annealed.

"The length of thread for connections, such as valves, fuse plugs, gauge, etc., must be equal to the standard lengths specified for different sizes of pipe thread tappings.

"Standard taper pipe threads must be employed on all threading for connections to cylinder, and these connections must be tapped to gauge with clean cut threads so as to insure tight joints.

"When a cylinder to contain inflammable gas is not to be boxed or crated for shipment, the safety and discharge valves and other connections must be made safe from injury during transit: (1) By being set into a recess of the cylinder so that it will be impossible for them to be struck if the cylinder is dropped on a flat surface; or (2) by a cap, or collar, fastened to the cylinder (not to the valve or connection), this cap or collar to be capable of withstanding a blow delivered in any direction of a 30-pound weight falling 4 feet, and constructed so that this blow will not be transmitted to the valve or connection; or (3) by such construction of the valves and connections that they will withstand a test consisting of standing the cylinder upright on its base and gradually tipping it over, allowing it to fall so that the end of the valve or connection will strike on a block of some unyielding substance, such as stone or iron (not wood). The block must be so arranged that the end of the valve or connection will strike the block just before the side of the cylinder strikes the floor or ground. No leak must develop under this test. During the test indicated in (3) above, the cylinder must contain compressed air or gas under a pressure of at least 50 pounds per square inch, and the absence of leakage after the test is completed must be verified by application of soapsuds or by other suitable method."

CHAPTER XXIV

EXPORT SHIPPING OF BULKY ARTICLES

SHIPMENTS of certain units of exceptionally large dimensions may involve peculiar problems of their own, ranging from provisions to be adopted for safely loading and unloading, up to special forms of protection of different kinds. Shipments of motor boats, aeroplanes, locomotive and other boilers, street cars, railway, freight and passenger cars, when not forwarded knocked down or dismantled, frequently assume the dimensions of a small house; and not rarely have to be carried on decks of steamers because too great in diameter to be passed down the hatchways, very especially in the case of older and smaller vessels, or sometimes because too long to admit of being stowed away in the holds because it is impossible to slide them diagonally through the 'tween-deck spaces. Everyone who has ever traveled on a foreign-bound steamship has observed a great many of these large deck shipments, and is thoroughly familiar with the fashion in which they are lashed to the decks, and the perils which they must necessarily undergo. They are exposed to all sorts of misuse and various kinds of attack from steamships' crews and from the steerage passengers, if any are carried, and even more seriously exposed to veritable deluges of salt water, as waves break over the decks, sometimes for several days in succession during a storm; while in any event they are bound to receive the full effect of downpours of rain, alternating with possibly a scorching hot sun in the tropics.

Case Construction.—Apart from the thoroughly strong construction that cases, when any are needed in the shipment of this sort of cargo, will require, no special instructions need here be noted, inasmuch as the subject has been fully dealt with under the heading of "Machin-

ery," and in Captain Knowlton's special chapter appearing in earlier pages in this volume. It may be well, however, to observe that in practice cases for all parcels likely to be shipped on steamers' decks should be constructed of matched—that is, tongued and grooved—lumber. Furthermore, the skids on which such cases are mounted, and which will in almost every instance naturally be supplied by the shipper for the safe transportation of his products, should, when deck shipments are contemplated or may become necessary, be of such a height as to raise the floor of the case above the deck. This will permit the free passage of sea or rain water under the case.

Sling Marks.—Much of the cargo of the description now under consideration is heavy as well as bulky, and often involves more power for loading and unloading than the usual ships' winches can supply. When this is the case, such exceptionally heavy pieces have to be lifted by special derricks either on wharves or on specially constructed floating lighters which are towed alongside of ships for this express purpose. When parcels are exceptionally long, it is often necessary to employ two winches or two derricks for their hoisting aboard, and for their unloading at destination or at transhiping points. In any event, after the suitable construction of cases—when any are required—the first and most important consideration is the determination of the center of gravity of the piece being shipped, and the location and suitable marking of the points at which the slings must be applied. In a general way, this point has already been discussed and fully emphasized in other chapters in this volume, to which reference should now be made.

Waterproofing.—Dangers incurred by deck cargo from rains or from the wash of the sea have already been emphasized. It seems to be the custom of shippers of this sort of cargo to give chief attention to the construction of a felt or tarred paper roof to cover the package intended for deck shipment, or which may have to undergo that kind of stowing. Specially prepared roofing is,

of course, admirable so far as it goes, but it is to be feared that a good many shippers forget or neglect the desirability of also protecting the sides and bottoms of the cases. Such protection is called for because of the obviously equal danger of wetting, and so far as the floors of cases are concerned, because of the very great danger of water seeping through, soaking up or stagnating in puddles on the floors, with possible resulting damage to delicate or susceptible parts of the contents of cases. With such considerations in mind, the shipper need only further refer to remarks on the subject of waterproofing in general which appear in many previous pages.

Protection Against Pilfering.—All bulky deck cargo is, as has been pointed out, open to the approach of every member of the vessel's crew, who usually have plenty of time to lounge about, whittle and generally amuse themselves with such objects. Cutting a hole in a large case carried on a steamer's deck might be an innocent form of diversion, or it might be done purposely with a view to getting a glance at the contents and seeing what was readily within reach inside of the case. Brass fittings, tool cases, accessories which might seem tempting, ought not to be placed inside of such cases, or at least if so placed, should be located in such a part of the case, or so protected from the walls of the case, that no pilfering, even by the removal of a whole board, would be possible.

Let us now proceed to an examination of the practice and policy of some manufacturers shipping products which may be of the description to which this chapter is devoted. It will be observed that just as some of the shipping features to which reference has just been made apply to other commodities, for example, automobiles, which are not considered especially under this heading, so also some of the products whose shipment is here described may be dispatched disassembled or in a knocked down condition, or they may sometimes be shipped practically assembled. See cut page 638.

Locomotives.—The European war made immense and instant demands upon the builders of locomotives in the

United States, and it was fortunate that this industry had prepared itself by a long and honorable career in the export field. Much that was new in export packing practice was developed by the exigencies of war, but the locomotive companies for many years have been aggressive and consistent builders for export trade, and the technical skill of the men in charge of this industry has made possible a very thorough and fundamental study of the shipping and packing problem.

The export packing of locomotives brings us the problem not alone of packing instruments of great delicacy and precision, but as well that of the successful disposition of large masses where the equalization of strains must be carefully watched. In addition to the equalization of strains and the careful study of gravity centers the case must be so constructed that it is fully sufficient for its purpose. This has brought about a most careful laboratory and shipping practice which, in the great locomotive factories of the country, has really developed into a science all by itself.

With reference to the export packing of locomotives, a well-known corporation supplies the author with photographs (see page 631), and with copies of its shipping instructions, from which the following is selected:

"1. *Construction of Packing Boxes.*

"A. For boxes exceeding 100 cubic feet displacement or weighing more than 5,000 pounds, use lumber originally 1¼" thick, rough planed on one side, or on both sides when this can be done in one operation. Boxes to be double boarded; inner course running longitudinally, outer course vertically.

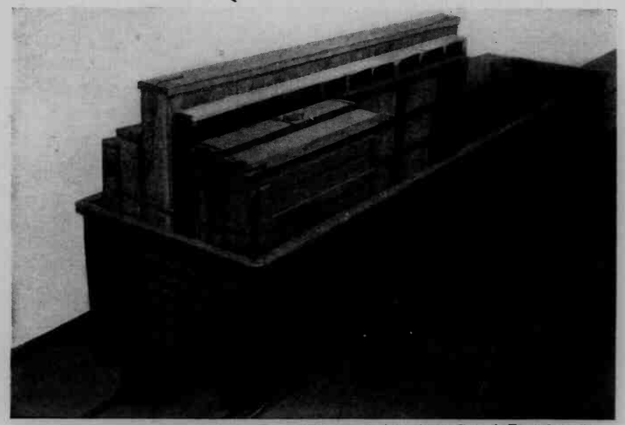
"B. For boxes smaller, or weighing less than that specified in the preceding paragraph, use lumber originally 2" thick, rough planed, using planed surface for outside of box.

"C. Make boxes of sound spruce or its equivalent, and use oak or hard wood of equivalent strength for battens and corners. Bind corners and sides of all boxes with 1½" hoop iron No. 16, secured by wire nails. Thor-

Courtesy of American Locomotive Co.

PACKING OF LOCOMOTIVE PARTS.

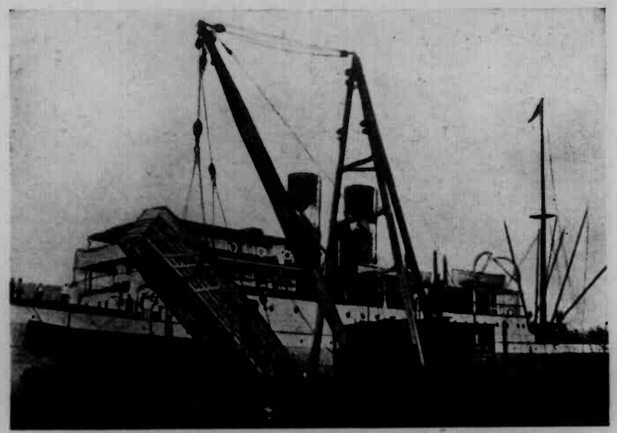
(Left) Case containing cylinder heads, guides, rods, and valves. (Right) Shows tender frame, brake details and piping in case.



Courtesy of American Car & Foundry Co.

PACKING OF FREIGHT CARS.

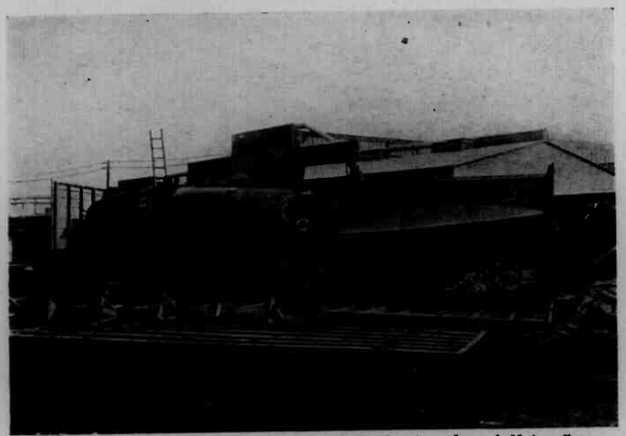
Freight car knocked down ready for shipment. Note all brass material has been removed.



Courtesy of Consolidated Shipbuilding Corporation.

CRATED LAUNCH BEING HOISTED ON SHIP.

Crate shown is for gasoline launch 42 feet long, 9 feet 6 inches beam, and 12 feet high, approximate weight 8 to 10 tons. Launch is firmly fastened in cradle and crate substantially built.



Courtesy of Curtiss Aeroplane & Motor Corp.

PACKING OF AEROPLANE.

Shows hull being shipped intact to facilitate erection in the field.

oughly secure material in all boxes to avoid any possibility of its shifting and consequent injury. Brace sufficiently between top and bottom of all boxes to avoid crushing when heavy materials, such as wheels, trucks, etc., are stowed on top.

"D. All packing cases should be ventilated by boring a line of holes two inches in diameter and four feet apart on all sides of the cases, about one foot from the top, and a corresponding line of holes one foot from the bottom.

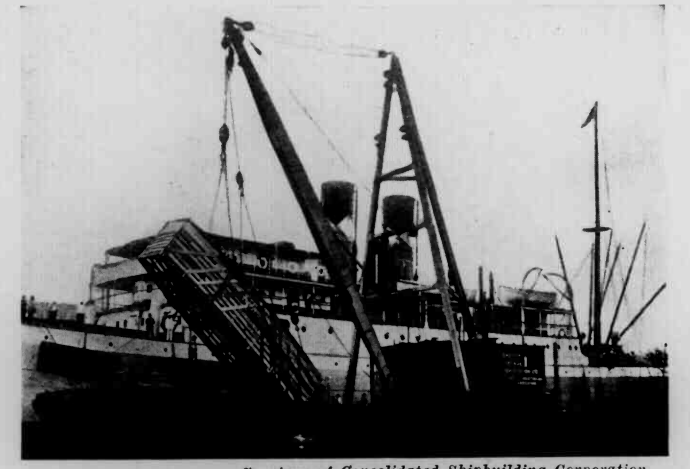
"2. *Packing Parts Into Boxes.*

"A. Ship nothing in which water is liable to have collected without draining, to avoid injury to parts by freezing. Avoid delay and annoyance in assembling engines at destination by packing all material necessary for each in boxes for that engine. Do not use excelsior, sawdust, shavings, etc., in packing. Allow nothing to come in contact with varnished surfaces of tank, cab and other material of like nature. Whenever possible, engineers who are to have charge of assembling engines at destination should be in the shop during the dismantling and packing.

"B. Steamship freight rates are based upon a displacement of 40 cubic feet per long ton, and charges are assessed on basis of weight or measurements at ship's option, whichever will net them the larger revenue. As far as possible, pack boxes so the maximum weight is obtained with reference to cubical measurements of box. The maximum length, height and width are used to calculate displacement of boxes or unboxed parts, such as boilers, driving wheels, trucks, etc. All projections such as dome cap and projecting studs must be removed.

"C. Bulky, heavy and lengthy cargo shipped overland via Pacific Coast ports, destined to Australia and Oriental points, are subject to arbitrary and transhipment charges beyond port of call given in Trans-Continental Freight Bureau Circular No. 55-A and supplements. As far as possible, such packages should be confined to weights or measurements *under* the following, on which extra charges are levied:

INTENTIONAL SECOND EXPOSURE



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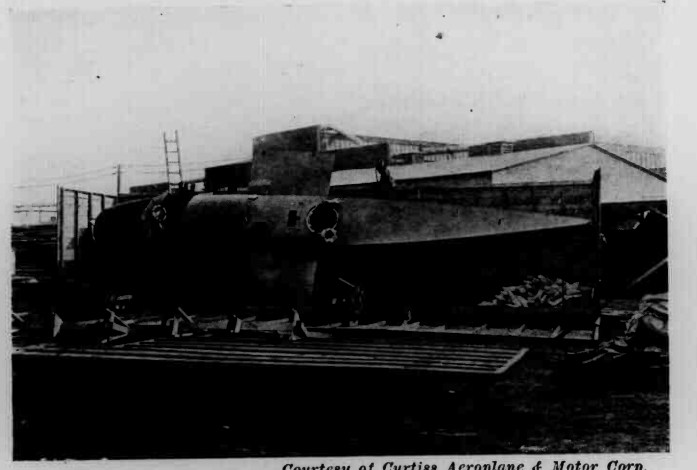

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"C. Bulky, heavy and lengthy cargo shipped overland via Pacific Coast ports, destined to Australia and Oriental points, are subject to arbitrary and transhipment charges beyond port of call given in Trans-Continental Freight Bureau Circular No. 55-A and supplements. As far as possible, such packages should be confined to weights or measurements *under* the following, on which extra charges are levied:

"Lengthy cargo—24′ or more--add 20% regular rate.

"Bulky cargo—2 tons (80 cu. ft.) or more—add 30% regular rate.

"Heavy cargo—each weighing 1 ton (2,000 pounds) or more—add 50% regular rate.

"D. The weight of individual cases, wherever possible, must not exceed three tons when shipment is made to South Africa. An additional freight rate is paid on shipments in excess of three tons. Tires on all foreign orders, when not applied to driving wheels, need not be cased.

"3. *Slushing Compound.*

"Mixtures referred to in these instructions are as follows:

"No. 1.—Composed of 20 pounds white lead
" 10 pounds tallow
" 1 gal. black oil
" 5 pounds beeswax

"No. 2.—Warren Slushing Compound.

"No. 3.—Compound similar to No. 2, made by General Electric Company.

"Note:—Mixture of No. 2 or No. 3 should be removed by use of carbon oil.

"4. *Marking Parts.*

"In the absence of specifications or special instructions, mark by stenciling, stamping, or with a zinc tag wired to the parts (except as noted), all parts which are removed from engine for packing, with the road number of the engine to which the parts belong and with the letters 'R' or 'L' (signifying its position on the right or left side) where necessary.

"5. *Stamping.*

"The character and finish of the work will determine size of stamp to be used, e. g., letters or figures 3/16″ high will be sufficiently clear for the motion work and other finished parts, but for rough and unmachined forgings or castings use letters or figures not less than ⅜″ high.

"6. *Tagging.*

"Wire zinc tags to parts not stamped. Linen tags

should not be used, as marking becomes illegible. Zinc tags to be made with 'Roovers' embossing press. On these tags add such information, in addition to marking specified in paragraph 4, as will clearly identify the character or location of parts.

"7. *Stenciling Packages.*

"A. The order number, serial number and letter indicating package will be stenciled on top and sides of boxes, illustrated by accompanying sketch, explained as follows: S-571 is order number. Numeral 6 is serial number of engine in order. Letter A (or any other letter) is package designation, for instance, S-571-6-A would mean package A of the 6th engine of order S-571.

Courtesy of American Locomotive Co.

"B. Packages will also be stenciled with the gross, tare or net weights in pounds and cubic measurements (some foreign countries also require weights in kilos).

"C. Unless advised to the contrary, packages comprising the first engine will be numbered from '1' up, the second engine '51' up, the third engine '101' up, etc. etc.

"8. *Preparing Packing Lists.*

"A. Make packing lists for each package on standard form P D 66-A revised, and summary on form P D 66-B revised. The packing lists must be complete and specifically mention every part that goes into a box for which list is made. Nine copies of packing list, showing gross, tare and net weights in pounds and cubic measurements,

and summary thereof for each engine (some foreign countries also require weight in kilos), together with bills of lading marked 'For Export,' will be transmitted to Traffic Manager on date of shipment.

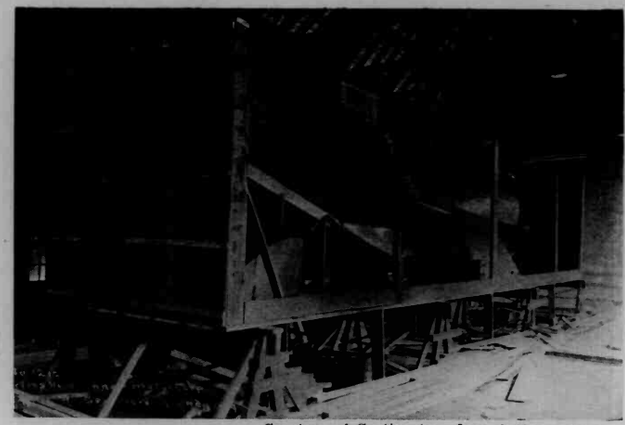
"B. When an order of locomotives is divided between two or more plants, the packing lists must be identical for each plant. A uniform packing list will be prepared and approved by each plant involved, after which it will be printed, leaving blank the space for the name of the works. In the event of deviation from the packing list as printed, due to short shipment, proper notation will be made on the sheet affected.

"C. Packing list must distinctly state whether the material is cased, uncased, crated or otherwise packed. For instance, shipments of globes or other glass in a barrel must be specified 'barrel' and not 'box,' as the foreign customs regulations are such that the least possible error in declaring consignments results in a heavy fine being imposed. These instructions must be strictly complied with.

"D. Weights and measurements given in packing lists must agree with those stenciled on boxes, as packing list weights are used for making declaration for customs, and custom authorities check these with weights stenciled on boxes. Check carefully to see that weights are properly figured out and that net weight stenciled on box is correct."

Railway Cars.—In an interview a large shipper described as follows the methods used in foreign shipments of freight and passenger cars:

Substantially the same methods are used in the shipments of freight and passenger cars, both classes of cars being disassembled and packed practically in the same manner. In the case of very small freight cars and in that of small trolley cars, sometimes there is no disassembling, and the cars are sent out cased so that they may be put on the rails as soon as received. The reasons for this form of shipment are generally questions of urgency when it is desired to place the cars in commission at once,



Courtesy of Curtiss Aeroplane & Motor Corp.

METHODS OF CRATING AEROPLANE.

Load of hull transmitted to framework of box by cross truss bracing. Note blocking to hold hull in place, precautions taken to prevent weaving so that projecting wings do not come in contact with box.

Courtesy of Curtiss Aeroplane & Motor Corp.

BRACING OF AEROPLANE IN PACKING CASE.

Hull in horizontal position on cradle corresponding to bottom lines. Hull rigidly fixed in place by two main bents and blocking. Padded auxiliary bents support "tail." As many auxiliary parts as possible are included in box.

INTENTIONAL SECOND EXPOSURE

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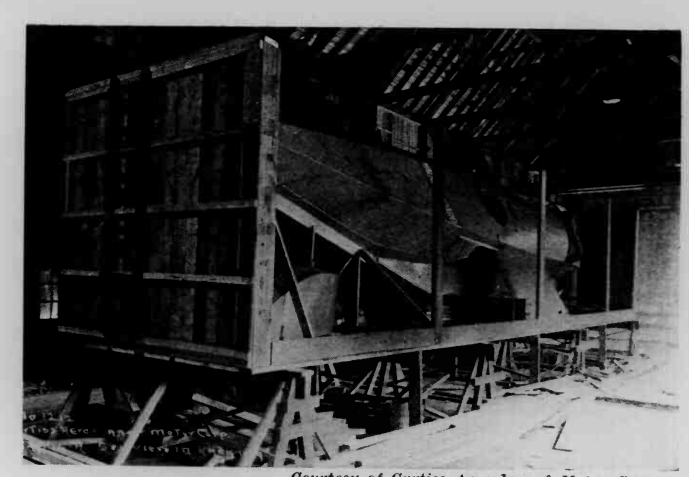

Courtesy of Curtiss Aeroplane & Motor Corp.

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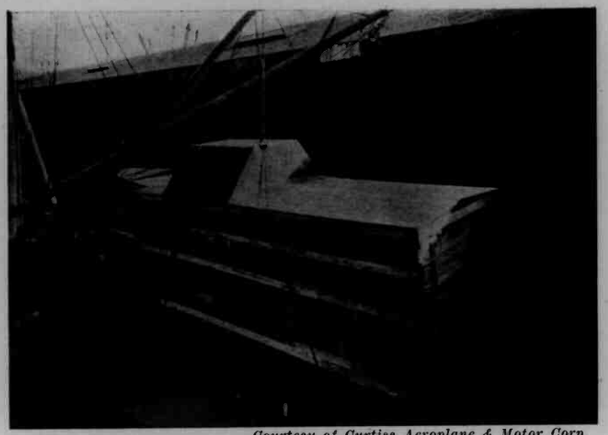
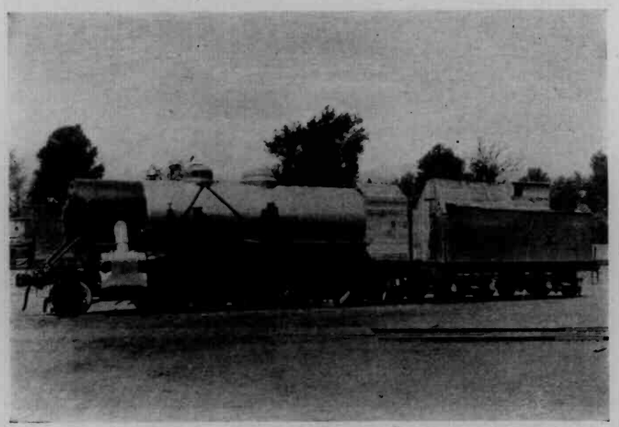


Courtesy of Curtiss Aeroplane & Motor Corp.

CRATED AEROPLANE.

Crated aeroplane being hoisted on ship.



Courtesy of Baldwin Locomotive Works.

LOCOMOTIVE PREPARED FOR SHIPMENT.

Pershing type locomotive prepared for shipment without being knocked down.

or where there are no adequate means of assembling them after arrival at destination. A typical package of such a shipment would measure about 8′ x 10′ x 18′, the case being constructed of 3″ material and solidly bolted together with long bolts running from one side to the other of the case. In addition to this the struts and other supports of the package are unusually strong, as a package of this size requires the most careful designing.

The great majority of shipments are, however, sent out disassembled, and the photograph herewith (see cut, page 631) clearly illustrates the method followed. This photograph shows one car complete as shipped. The trucks are shipped by themselves, as shown in the photograph, after the removal of all brass bushings and other brass material, as there is danger of this being stolen en route. These fittings, as well as other parts, are packed in a standard case. The floor of the car is shipped as one section, except in cases of exceptionally long cars, where the shipment may be composed of two sections. The two ends are placed back to back and shipped as one package, and the sides are treated in the same way as the ends. The roof may be shipped as one or two sections, except when composed of galvanized iron or steel, in which case the material is shipped knocked down and the roof built after arrival of goods at destination. This description applies as well to passenger as to freight cars.

Motor Boats.—The export packing of the launch or motor boat offers some very interesting problems, as does that of the packing of the gasoline marine engine. In the case of the launch, the boat must be thoroughly protected, as many of these craft have had considerable sums spent on the finish of wooden and metal parts, and in addition there is the problem of the handling of a large mass which must not be subjected to undue strains. A prominent manufacturer of launches and engines writes as follows: "We have had considerable experience in the packing of launches and engines for export. In shipping a launch which is forwarded by steamer, the destination being the first port of call, we use a substantial

INTENTIONAL SECOND EXPOSURE

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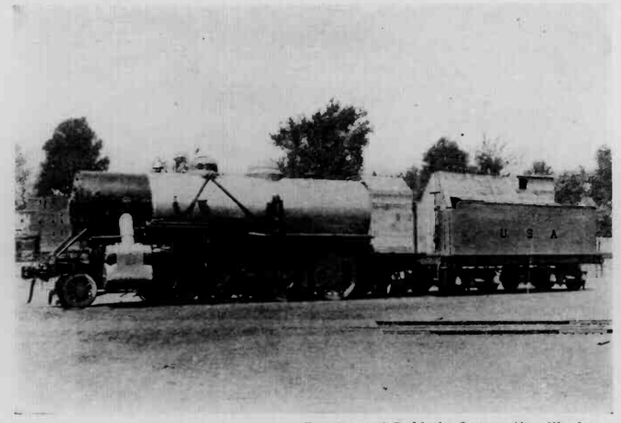

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shipping cradle and cover the boat with a strong muslin cover to protect it from dirt while en route. This we have found very satisfactory from the standpoint that in handling the boat from the water to the steamer's deck and again back into the water at the port of destination, the people, in handling it, can readily see what they are doing. However, in the event of shipping boats that remain on deck while calls are made at other ports for discharging cargo, we then deem it advisable that the boat be thoroughly crated or boxed. This, of course, is very expensive and it requires considerable work and material to make a substantial crate that will offer the proper protection, and at the same time be strong enough to stand the weight of superimposed cargo.

"The photograph (reproduced on page 632) will serve to give you an idea of the crating arrangement used by us for shipments. These photographs show a crate as made to protect a cabin gasoline launch 42 feet long, 9 feet 6 inches beam, and 12 feet high, weighing approximately 8 to 10 tons. This launch was shipped to Chile, and as you will note, it was necessary for it to be picked up at an angle so that it could be loaded into the hold of the ship. This, you will appreciate, is quite an undertaking, inasmuch as the crate must be built substantially and the launch fastened securely to the cradle while it is being handled in this position.

"The method of crating launches is that a substantial cradle is bolted together under the launch, then the launch is securely lashed fore and aft to the cradle to prevent it from shifting. The uprights for the cradle are then fastened to the cradle, with braces across the top of the uprights as well as across the back of the uprights. The crating material is then fastened fore and aft from the ends and over the top with braces running diagonally as shown. This method stiffens the crate and relieves the boat of strain and the crate of excessive strain. The top of the crate is always tight and covered with tar paper, preventing the weather from injuring the launch.

"In shipping large engines for export to Bombay,

India, or points of that distance, our usual practice, where the engine weighs five to ten thousand pounds, is to build a substantial cradle, bolt the engine to the cradle, and the box itself of tongued and grooved material, double thickness, laid diagonally. A box of this kind is substantial enough to withstand any amount of weight that can be piled on it in steamer's hold.

"Our method in shipping boats to the Panama Canal has been to furnish shipping chocks, as a boat usually is always the last thing aboard a steamer and the first part of the cargo discharged. Therefore, the crate is unnecessary at times, as with large packages there are no facilities for discharging it on a dock."

Aeroplanes.—A large manufacturer and exporter of aeroplanes and flying boats has encountered several peculiar and unusual problems in making export shipments, chief of which, perhaps, is that of guarding against the buckling of his very long and comparatively light cases in the process of loading and unloading. The minimum dimensions of the cases in which the hulls of these machines are shipped are 43′ x 12′ 8½″ x 10′ 5″—a total of 5,673 cubic feet, or about 142 measurement tons. This manufacturer supplies a number of highly interesting photographs, which may be referred to on pages 632, 637, 638. However, it is to be noted that the engineering staff of this company is now engaged in a series of researches and experiments looking to the solving of the delicate and serious problem of so staying these long and light cases that no danger from buckling can be involved.

In shipments of this description there is not only the question of shipping the entire hull intact in order to facilitate quick erection on the field, and the construction of a box that will offer adequate protection to the hull during shipment, but there is also the question of meeting railway requirements of "clearance widths" (when maximum width is 13′ 6″ over the projecting wings). In the shipment of one exceptionally large machine required during the war by the French Government, and to be delivered ready for operation, it was necessary to employ

two canal boats lashed together, and on one occasion partially to wreck a bridge over the canal through which the shipment had to pass on its way to tide-water. It is to be noted from the photographs that the load of the hull is transmitted to the framework of the box by means of cross truss-bracing. Various blocking arrangements, cushions filled with excelsior and braces, hold the hull in place, special precaution being taken to prevent weaving so that the projecting wings do not come in contact with the box.

In general, the side walls of boxes are made of two layers of boards, completely lined with heavy waterproof paper. All metal parts of the machine are liberally covered with vaseline, and all wires wrapped with paper.

The bottoms of the cases have supporting skids, beveled off at the ends. Special attention is paid to the waterproof protection of the tops of cases, and all corners are strongly reënforced by iron banding which, in the instance of the waterproof tops, extends all around the cases.

So far as possible, auxiliary parts are included in the shipping cases for the hulls, but in many instances the panel or wing boxes are packed flat in special cases, separated by spring board slats which serve as cradles, these boxes being intended for vertical shipment; skids are provided on both tops and bottoms.

Further details regarding these shipments will be noted in captions to the several cuts.

CHAPTER XXV

PACKING PRACTICES IN EXPORTING SUNDRY COMMODITIES

EVERY phase of export packing has been exhaustively treated in great detail in this volume. The construction of cases and crates, the making of bales, the shipment of bags and bundles, the kinds of lumber to be used, nailing and strapping, protection against pilfering, the interior packing of cases—all have been dwelt upon. In this chapter will appear quotations from letters illustrating the practices of prominent American manufacturers and shippers as applying to the export shipments of their particular products, which it is hoped and believed will prove both interesting and helpful to other shippers, not only of the same products but of merchandise comparable to that here mentioned, so far as packing requirements at least are concerned. The excerpts given below should be interpreted in the light of the fact that they represent actual practice, and that such practice may, in certain cases, be susceptible of improvement.

Before proceeding, however, to a résumé of some of the more striking and important from among the hundreds of letters received by the author, reference may here briefly be made to one feature of shipping for export which has not previously been extensively discussed.

Crating Together Small Boxes.—Certain advantages may be gained, when boxes of quite small size are shipped, by combining in one shipping package several of the small cases and strapping them into a crate, preferably with metal banding, although this is sometimes accomplished by the use of wooden cleats. The advantage referred to is most notable in the saving of handling charges, which may be imposed either at port of

shipment or at ports of transhipment or ultimate destination at a stated rate per package, rather than at a rate on a weight basis. In a great many countries and in various ports of the world, ranging from Buenos Aires to Constantinople, charges for landing from steamer to wharf, carriage from wharf to custom house, porterage in and from the custom house, etc., may be based on the unit handled, no matter what its weight. In such instances the charge on a small box of corn starch, for example, will be identically the same as the charge on six boxes of corn starch if they are crated together, making one piece for handling purposes. Furthermore, there is the consideration of ocean freight charges, which, as has been repeatedly emphasized, are more often than not on the basis of the measurement, not the weight ton. If small cases are shipped individually the measurement of each may involve a fraction of a cubic foot, which will be counted as a whole foot in assessing the freight charge, which is usually on the basis of even feet. The aggregate measurement of a shipment of a number of individual small cases may, therefore, very much exceed the measurement which will be made of a combination of the same number of small cases, if strapped together and shipped as one package.

A great many kinds of merchandise are customarily shipped in small boxes, including not only such products as corn starch and raisins, but, as will be noted in the chapter in this volume devoted to hardware, makers of small electric fan motors are accustomed to pack them individually in cases, crating three or more individual boxes together into a single shipping package. Hand sewing machines are usually packed in small individual wooden boxes, two, three or four of which are strapped together into a single crate, usually in this case with wooden cleats. A photograph submitted by a manufacturer of stove polish, reproduced on page 620, shows the method of crating together small boxes of this product, two or more of which are strapped together as illustrated. Each case is individually bound with iron to give it

strength and also to minimize the possibility of pilfering.

German exporters, before the war, were reported as utilizing this method of crating together small individual boxes into a single shipping crate and as having introduced a variation of this kind of shipping, which indeed has not been unknown to some American shippers. When such shipments were dispatched to Central American destinations and to some other countries where import duties are levied on the basis of gross weights, arrangements were made with the ship's carpenters before discharging packages of this description from the ship's hold to knock off the outside wooden crating which held together the individual small boxes, thus saving the importers the necessity of paying duties on the weight of the wooden crating which held the individual units together. This may be a rather delicate undertaking in a number of respects, but the thought and study brought to bear on shipping problems thus illustrated may well be taken as an example and inspiration to all export shippers.

Proceeding now to a review of some of the letters received from important manufacturing concerns describing their practices in export packing, the following are recommended as deserving of careful reading and study:

Provisions.—For many years the great packing companies of the United States have been in the front rank of aggressive and constructive exporters. Indeed, they represent the type of exporter, more or less a pioneer in America who, by investing large sums in foreign countries, has performed that double service which is the ideal of export work; that is, while expanding American export trade they have also brought efficiency and development to more or less primitive countries.

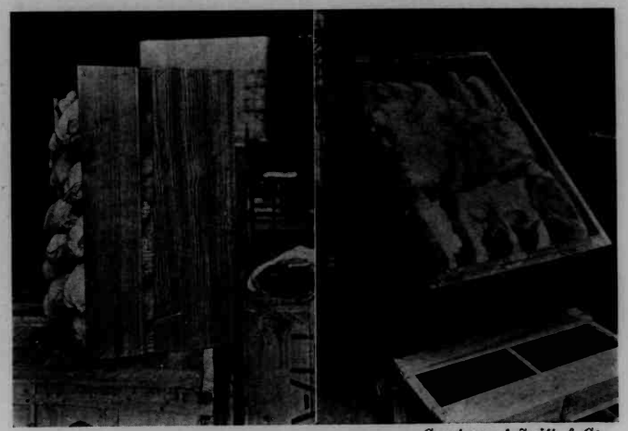
The export packing done by the great provision companies is bewildering in its volume and complexity, and there is probably no angle of the work that has not been considered in this multiform packing endeavor. For example, the experimental side has been most carefully developed, and all sorts of drop and tension tests have

been applied to the different packages. In addition to this the most exhaustive research work has been done with two trip packages, or packages sent to foreign countries and then returned simply to see the effect of the voyage. Moreover, results have been consistently and thoroughly checked, and inspectors have been constantly at work studying the conditions in foreign fields and reporting back home what these conditions were. For example, a style of packing will be adopted which seems to satisfy requirements, but the shipping department is not content with mere appearances. This package is sent out and all of its vicissitudes are observed. If it has to go through the test of being tossed to the ground from the head of a West Indian negro this fact is noted, or if other conditions have to be met a study is made of these conditions. Because of these facts it would well be possible to devote a large book to the export packing of a great provision house. It has been sought, however, in this chapter to present certain typical containers that represent quite a wide range of usefulness.

Photographs supplied by a very large packing company are reproduced on page 647 and are in general sufficiently described by the captions printed under each cut. The following points are, however, to be noted. In the shipment of smoked meats cases are constructed with open spaces on both sides in order to give air circulation, the meat contents being protected from rats and other vermin by a wire netting, as illustrated.

Large cases holding 500 or 600 pounds of hams or similar products packed in salt, shipped most generally to Europe but also to certain southern markets, are usually protected at the ends by hickory bands, which this company has found preferable to iron bands in the shipment of these goods, thus preventing injury to stevedores or others.

Shipments of lard compound in tins are commonly packed by this concern in crates as illustrated in photographs on page 647. The advantages of the crates are that in certain countries duties are paid on the gross



Courtesy of Swift & Co.

SHIPMENT OF SMOKED MEATS AND HAM.

(Left) Case contains smoked meats, is constructed with open spaces for ventilation, meats being protected from vermin by wire netting. (Right) The ends of this case, containing from 500 to 600 pounds of ham, are protected by hickory bands.

Courtesy of Swift & Co.

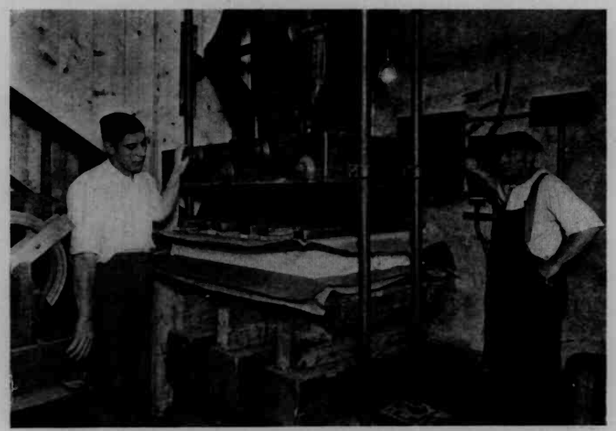
CRATED LARD TINS.

In this instance advantage of crating lies in reduction of duties paid on gross weight.

Courtesy of S. D. Warren & Co.

CASING OF PAPER.

Cases made of 7/8" lumber containing 500 pounds of paper. Ends of cases are cleated on both sides.



Courtesy of National Paper & Type Co.

METHOD OF BALING PAPER.

Tops and bottoms of bales are of solid white pine. Waterproof paper and burlap form protective covering.

weights of the packages which are materially reduced by the use of crates, but which at the same time supply a substantial package for shipping purposes. It might at first glance be thought that a good many of the tins would be damaged because their sides are exposed through the crating, yet it is reported by this company that complaints are very rare indeed and that even though a tin may occasionally be punctured and some of the contents leak out, yet the company's customers figure that the net saving in the duties through the use of these crates justifies the risk of damage in transit to some of the tins when thus shipped.

Paper.—The effect of the war on the export of paper is clearly revealed in the government reports since exports of paper increased from $46,393,655 in 1917 to $54,170,134 in 1918, and $86,983,063 in 1919. The war operated in a number of interesting ways. The United States was practically the only country in a position to do a world business, the Webb Bill led to combinations in trade beyond seas, and in addition we had a great increase in the intensity of the merchandizing drive on the part of individuals and concerns doing an export business. Undoubtedly, also, the war operated favorably in the sense of inducing paper exporters, both jobbers and mills, to give serious attention to the requirements of foreign countries with reference to grades and sizes of paper that differ from those in domestic use, and also in creating a disposition on the part of the mills to make runs that the foreign customer requires.

If it were suitable there is no doubt that a bale would represent the ideal package for paper. There would be a saving in measurements and consequently freight, the weight would be less and ease of handling would be greatly facilitated. Moreover, the danger of case breakage is eliminated with a baled package, and a bale will stand an amount of bad handling that would make the most sturdy case turn faint. However, as a rule, fine papers must be cased, although even with this class of goods European mills do more baling than American mills.

INTENTIONAL SECOND EXPOSURE

Courtesy of S. D. Warren & Co.

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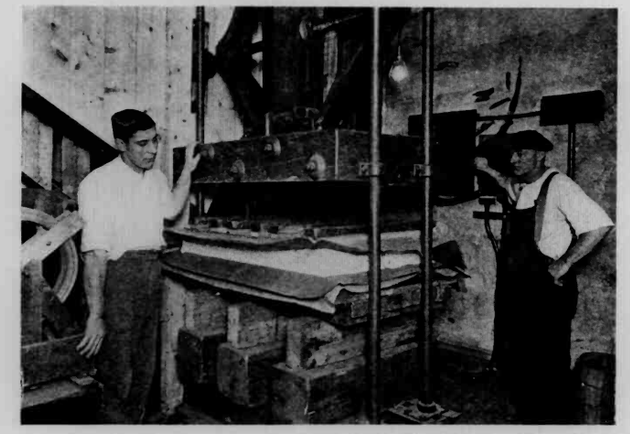

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If it were suitable there is no doubt that a bale would represent the ideal package for paper. There would be a saving in measurements and consequently freight, the weight would be less and ease of handling would be greatly facilitated. Moreover, the danger of case breakage is eliminated with a baled package, and a bale will stand an amount of bad handling that would make the most sturdy case turn faint. However, as a rule, fine papers must be cased, although even with this class of goods European mills do more baling than American mills.

A house whose papers are well known in many foreign countries sends a photograph (see cut, page 648) of its standard export case and states that: "A standard case to carry 500 pounds of paper is made up from 7/8" lumber. The ends of the cases are cleated on both sides giving a double nailing surface. There is a waterproof wrapper in each of the corners, a waterproof lining for the entire case, and inside of this a heavy plain lining with cardboard in the bottom.

"After the case is filled with paper, a cardboard is placed on top and the wrapper is folded in so that when the lid is nailed down, the case is practically waterproof.

"Steel straps are placed around each end of the case and steel bands around the body of the case. These are tightly drawn and fastened. The straps around the body of the case are not nailed because of the possibility of injury to the paper. A small staple is used to prevent the straps from rolling up when being handled.

"Export bales are covered with heavy waterproof paper, sealed, a heavy plain wrapper unsealed, and then burlap, this latter sewed at the sides and ends. A hardwood board with four wooden strips running across it, is placed at the top and bottom of the bale.

"The bale is prepared on the bed of the press and after being wrapped is submitted to a pressure of 24 tons and while under this pressure four steel bands are drawn on and fastened with steel buckles. The bale is then taken from the press and staples are put over the hooks and in the cleats to hold everything in place."

Another house doing an active export trade in paper sends photographs illustrating baling of its products, pages 648, 655, 656, and the following summary of the method employed:

The photographs represent typical bales of paper and this method is used for large or small bales. The bales shown in the photograph were prepared for muleback transportation and formed part of a shipment to Colombia. The weight in this case was approximately 200 pounds per bale.

The bales are made up with solid wood tops and bottoms, the boards being new 5/8" white pine and the cleats 7/8" material of the same wood. The first protective covering is burlap and the second a high grade waterproof paper. The bottom of the bale is first put in the press, then a piece of burlap, then a sheet of waterproof paper, then the commercial paper that is being shipped, and on top the same materials are placed as those on the bottom. This is shown in the first photograph.

The second photograph illustrates how the metal bands are put on the bale after pressure has been applied, the bands being fastened with a special non-slip patent buckle. The use of the buckle obviates the necessity of nailing.

The bales are then taken from the press, the waterproof paper folded in and the burlap tightly sewed, as shown in the third photograph. The fourth photograph shows a number of completed bales ready for shipment.

Shipments of roll news are usually sent out from the United States uncrated although this does not imply that such is the best method. On page 656 is shown a photograph of roll news in crates from an American mill. Commercially this is too expensive a package, although rolls crated in this way do not suffer damage from stevedores' hooks, from cutting by cables, from bursting by falling, and so on, and certain European manufacturers have devised an inexpensive method of packing roll paper in which a very light crate is used. In any instance, however, the question is whether the damage to the uncrated rolls is greater than the cost of crating.

The Writing Paper Manufacturers' Association gives the following instructions for baling paper:

"In shipments to overseas countries it is very important to take into consideration the freights, especially in these days of very high freight rates.

"It is equally important that proper protection be given to the paper in the way of packing, which will prevent damage to the goods by bad handling at loading and unloading points.

"In some countries, particularly on the West Coast of South America, where the cargo is usually lightered from the steamer to the pier, sometimes under very rough sea conditions, it happens that packages are broken open and the contents very seriously damaged.

"For any but the better grades of paper an export bale is preferred to a case as the bale reduces considerably the measurements, therefore reduces the marine freight, yet protects the paper sufficiently, especially if the regulation bale is adopted and carefully made.

"In some countries the port charges, usually very high, are assessed on the gross weight of the shipping package, thus favoring European competition where baling is invariably the method of packing adopted.

"While hydraulic baling is preferable it is by no means imperative; as a matter of fact, a better bale is often made as a jack bale, as mentioned below, by the ordinary method employed in some mills, than where a hydraulic apparatus is used.

"The specifications for the standard export bale are as follows: Unless otherwise instructed, reams are to be placed flat in bales. At rare intervals, sheets are required so large that it becomes necessary to have each ream folded once. If reams are folded they are to be placed in the bale with folded edges alternating.

"If order calls for sheets ream wrapped, each ream is taken separately and entirely wrapped with strong paper and sealed with sealing wax or tape; gummed tape is preferred because it leaves no impression in the better papers such as M. F., S. C., Writings and Boards.

"For each bale two wooden heads are provided. These heads are preferably constructed as follows: Two layers of ⅜" lumber nailed together, the boards in the upper layer running opposite to the boards of the under layer. All heads are one quarter inch longer and wider than the size of sheets to be baled. (For example: For sheets cut 24" x 40" the heads should measure 24¼" x 40¼.") The practice obtaining in some mills of putting heavy wooden cleats on single boards at the top and

bottom should be substituted by the above method, inasmuch as the steamship companies measure to the extreme dimensions of a bale and charge accordingly—a half inch addition being counted as a whole, and in a shipment of a considerable quantity making quite a difference in the freights payable.

"The regulation or standard bale is 500 pounds gross, although bales are often heavier than this. Occasionally smaller size bales are specified for which differentials should be charged to cover the additional costs.

"The process of making the bale as a jack bale is about as follows: Place on a truck about three feet high two pieces of ⅞" band iron, lengthwise of the sheet. Then a wooden head goes on above the band iron. Next two sheets of heavy screenings or strong sulphite paper are laid down, same being of sufficient length to cover one-half of the bale. A mill doing a great deal of baling has found most efficient and even stronger than burlap, which is often used instead of paper, what is known as 'Bull Hide Wrapper,' of a weight 24" x 36"—230 pounds.

"The reams are then piled on neatly and evenly; above the whole a duplicate of the bottom equipment is placed—first sulphite wrappers and finally a wooden head. Then four cross strips of ⅞" No. 22 band iron are laid upon the wooden head and the pressure is applied by jack, where this is used, or by hydraulic press where available. Hydraulic bales are built in the press. When a certain pressure is reached, with the degree of which the finishers will soon become familiar, the jack or press is stopped, the wrappers are neatly folded in and fastened strongly. After this is properly done the cross strips of band iron (which are of sufficient length to reach around the bale and lap) are drawn tight and buckled with one inch buckles or seals supplied by the Signode Company; the bands running lengthwise are then tightened and buckled. If buckles are used a piece of burlap or canvas is wound around the bands at the buckles to form a protection for the edges of the paper; then pressure is relieved and the bale is complete.

"Mills not equipped with hydraulic presses might find it advantageous to correspond with the makers of inexpensive instruments used for tightening the iron bands and finishing the buckling. Bulky paper can be baled with this system without a baling press of any kind, but care should be taken to buy the instrument for 7/8" iron bands (thickness No. 22), as nothing less will carry safely a standard bale of 500 pounds. Some mills have met with failure in trying this system with 5/8" instruments. A set of instruments consisting of two ratchets and one sealing device formerly cost $30.

"For the more expensive grade of paper it may be best to add burlaps to the baling press, when this commodity will have returned to a more normal price."

The illustrations shown with this text (see page 661) are published by the association for the purpose of showing baling methods recommended in the above bulletin.

A large San Francisco firm of general exporters dealing chiefly with the Orient, calls attention, in a letter devoted particularly to exports of paper, to many complaints received from its customers in the Far East which refer to the practice of some paper makers of shipping in packages merely wrapped in heavy paper and bound with light rope; in consequence of which practice the covers are frequently entirely torn away by the time the shipment arrives at destination and the identifying mark lost. In shipments of paper in compressed bales, burlapped and crated, a method of packing considered ideal for certain papers, consignees in the Orient have found that the board was not strong enough and the strap too light to stand rough handling. Complaint has also been made of shipments of book paper in cases of too light or overdried lumber, which arrived broken with resulting fraying of the edges of the sheets of the paper, all of which had to be trimmed before they could be used. Customers of this export house insist that every ream of book or other high-priced paper must be ream wrapped, and that more attention be paid to the marking in order that identification at destination may be easy, each case of one weight

Courtesy of National Paper & Type Co.

BANDING OF PAPER BALES.

Illustrates method of fastening metal bands with buckles after pressure has been applied.

Courtesy of National Paper & Type Co.

FINAL PACKING OF PAPER BALES.

Waterproof paper and burlap folded and sewed.

INTENTIONAL SECOND EXPOSURE

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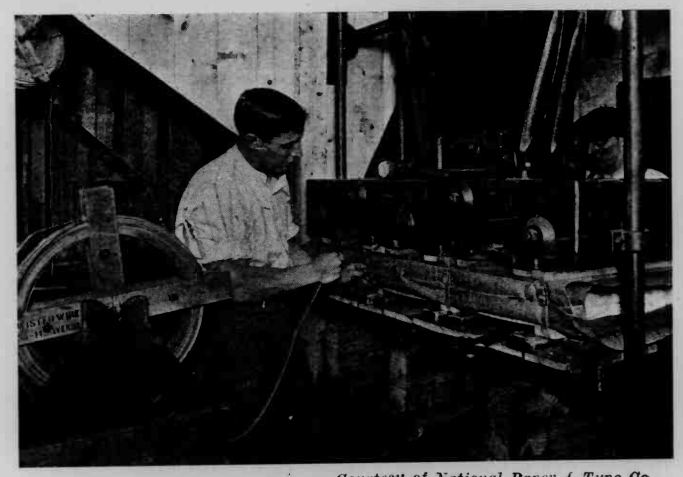

Courtesy of National Paper & Type Co.

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Courtesy of National Paper & Type Co.

FINAL PACKING OF PAPER BALES.

Waterproof paper and burlap folded and sewed.

Courtesy of National Paper & Type Co.

BALES OF PAPER READY FOR SHIPMENT.

These bales were prepared for muleback transportation and formed part of a shipment to Colombia.

ROLLS OF NEWSPRINT IN CRATES.

Rolls crated in this way do not suffer damage from handling.

to be numbered consecutively, should specifications contain several different weights, and the weight sheet to be in exact accordance with both net and gross weights.

A large New York export house, commenting on demands which are sometimes made on American manufacturers for the casing of shipments of newsprint and other papers, remarks that loss in shipping the American way rarely reaches 2 per cent, which is actually less than the cost of boxing would amount to. Therefore, it is believed that the American practice is preferable, but it is pointed out that pressure ought, if possible, to be brought to bear on the steamship companies to reduce the use of hooks in loading on board vessel at American ports, since practically all the damage comes from the careless and indiscriminate use of such hooks.

Specifications for packing of the General Engineer Depot of the United States Army include the following: "Roofing paper will be shipped in rolls, wrapped in stout paper well gummed down, with cloth pasted over the ends and on to the sides; or equal method. Roofing paper in rolls should be stacked on ends, and away from steam pipes."

Leather.—With an increase of more than four hundred per cent in leather exports in 1919 as compared with 1918, the exports in 1919 amounting to $218,784,060, the United States takes its place in the front rank of the great leather exporting countries of the world. It is true that a continuation of this immense volume of business is not to be expected as conditions become normal, but none the less it is certain that a considerable portion of the gain will be conserved.

It is gratifying to note that manufacturers of all leather products have been keenly mindful of the necessity of good packing and well considered protection for this commodity. Humidity, oil, abrasion, and a number of other perils must be guarded against in overseas shipments of leather, and the progressive exporter has made every effort to meet the various requirements.

A photograph shown on page 662 illustrates pack-

ing of high grade calf skins. The letter of the manufacturer accompanying the photographs reads as follows:

"We consider the item of packing most important for the American exporters competing in foreign markets, and we are therefore gladly giving you some data in connection with the packing of our products. No general rule can be applied for packing, inasmuch as the packing should be made adaptable to the rules prevailing in some countries, this being very important to avoid payment of overcharges by the consignees.

"As a rule, we always endeavor to do our packing so as to facilitate handling, wrapping our leather in such a way as to have the goods entirely covered with gray kraft paper and tied with tape. These bundles are in turn packed in cases made of high-grade lumber, so that they will be as tight as a wooden case can be. Before the goods are placed in these cases, each case is lined with waterproof paper, the leather is then put in and a layer of waterproof paper placed on the top and the covers put on. To give more strength, each case is bound on either end and in the middle with ⅝" box straps.

"The marking of the cases is also a very important item and should receive proper attention from exporters. We mark each case in two places with outside dimensions of box, namely, length, breadth and thickness, and with the gross, legal and net weights, together with initials of the consignee and the port of destination. We sometimes add the route by which the package is sent to facilitate its delivery."

A large shipper writes: "Patent leather is japanned by covering with enamel and baking either in the heat of the sun or in an oven. Therefore, it is very susceptible to heat or cold and must be very carefully packed to prevent sticking or cracking.

"Leather is sold in 'sides,' which are just what the word would indicate—that is, the hide of the animal is cut down the back, and the hide from each side constitutes a 'side' of leather. A side of cow leather measures about 18 square feet.

"In preparing for packing, the sides are folded over a square frame made of two parallel strips of wood joined by two parallel strips of cardboard. Upon this frame a half dozen or sometimes a dozen sides are folded over each other in three folds, forming a bundle that is approximately square. The sides are laid on top of one another in pairs, with the finished or hair surfaces toward each other, and between each side of a pair as well as between the pairs there is a layer of cotton felt.

"The sides are wrapped with wrapping paper, or, in shipment to most ports, with waterproof paper, and they are packed in a flat wooden case made to measure. The cases are usually iron strapped, the straps being nailed to the case. If ordered, additional protection from moisture and from thieves is provided by lining the case with tin, the top of the tin inner case being soldered on; sometimes an inner case of wood, instead of tin is used. Especially heavy leathers—not patent—are sometimes packed in bales instead of cases, and chicken wire is wrapped around the bales to prevent theft."

Another large manufacturer of patent leather states: "One dozen sides of patent leather are packed to a bundle, the finished sides being face to face. Cotton wadding is placed between these sides. Bundles are folded in four folds by folding first through the middle then folding in half again. On the outside of each bundle, a tally of the foot measurement with the grade and weight is pasted, as well as a label: 'Do not handle until thoroughly warm.'

"Leather is then ready for casing. The bundles are tiered, or piled, one on top of the other as evenly as possible, and an actual measurement is taken so that the goods may fit the case snugly to prevent them from shifting. Goods are packed, as a rule, about twenty to twenty-five dozen to a case measuring from ten to fifteen cubic feet. Larger goods, hides of about eighteen to nineteen square feet, are packed about fifteen to twenty dozen to a case. These cases are lined with waterproof paper to prevent as much moisture as possible from getting to the

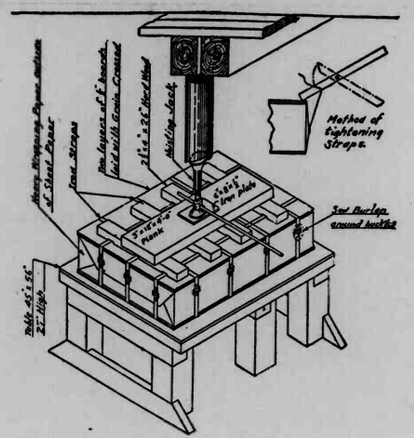
goods. As these cases are faily large, averaging about three hundred to five hundred pounds, it is advisable that 7/8" stock be used, with iron straps and cleats as well as nails, so that they may be safe and secure in transit.

"Patent kid is packed the same as the sides as far as the cotton wadding is concerned, but there are two dozen skins to a bundle, and they are not folded but are laid flat. About twenty-five to thirty dozen skins are packed in a case. The cases being much smaller and lighter in weight, it will not be necessary to use such heavy stock as for side leathers; in these cases, 5/8" stock is used.

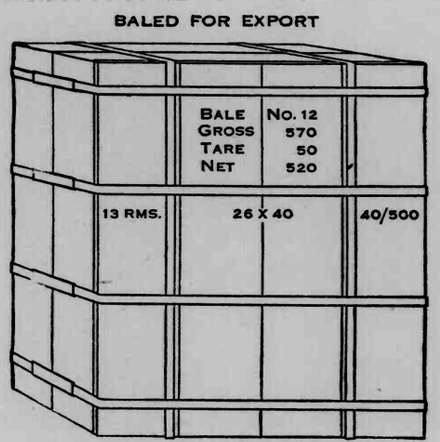
"When packed, the cases are stenciled as to mark (representing name and address), number, gross and net weights, as well as measurements. All cases containing leather should also be stenciled: "Keep dry and do not store next to any boilers.' It is preferable to have such indications appear not only in English but in the language of the country to which shipped."

It may be pointed out that considerable discretion must be used by shippers of patent leather in the choice of material with which to separate the japanned sides of the different skins. Tissue paper sometimes used for this purpose, often, when shipped through hot waters or across the equator, adheres to the enamel and results in loss of as high as 60 per cent of the shipment. Furthermore, leather ought not to be shipped in uncased bundles when it is possible to avoid so doing. Certainly such bundles ought never to be protected merely by paper which is almost certain to be destroyed in the course of shipment with loss of the identifying marks. There must be adequate protection by waterproofing materials as well as paper linings, strong outside burlap wrappings and every insurance against damage from hooks.

Leather Belting.—American leather belting has made an excellent place for itself in export trade, and no small part of this success has been due to the care with which the goods are packed. There are a number of interesting angles in belting packing, although the main point is adequate protection against humidity. In the photo-



Courtesy of Writing Paper Manufacturers' Ass'n
METHOD OF BALING SHEET PAPER.
For full description see text.



Courtesy of Writing Paper Manufacturers' Ass'n
BALING OF PAPER FOR EXPORT.
Note method of banding and marking.

Courtesy of Burnet Leather Co., Inc.

PACKING OF CALF SKINS.

Leather bundles wrapped in kraft paper and tied with tapes are placed in case. Note that case is lined with waterproof paper.

Courtesy of Chas. A. Schieren Co.

PACKING OF LEATHER BELTING.

Process of baling; belting is first wrapped in rubber cloth.

graphs annexed to this chapter stress has been laid on the waterproof coverings provided for the belting, and this point must be most carefully considered. Strength of package is also of great importance, as the contents of this class of shipment are not only of considerable value but the weight of the case is fairly great.

A well-known manufacturing company submits a statement relative to its export practice, to be considered in connection with photographs reproduced on pages 662 and 667, which may be summarized as follows:

Leather belting is put up in rolls packed in burlap with rubber cloth, the waterproofing material being on the inside next to the belting. The burlap used is of heavy texture, 10 ounces, 40 inches wide, the bales of the belting weighing from 600 to 700 pounds, usually in rolls of about 100 meters length (328 feet). Five or six rolls securely fastened together so that they will not rub or the ends become loose while in transit are placed in suitable, strong and heavy wooden cases, usually of 1¼" stock, securely strapped with band iron. The rolls are usually tied with heavy rope and the waterproof cloth and burlap sewed securely with 30-ply Osprey sewing twine. Details of the methods adopted by this concern in its export packing will be observed from the photographs to which reference is made.

Packing of Automobile Tires.—The value of the exports of automobile tires during the fiscal year 1919 was over six times that of 1914, and in the case of a number of countries as much money was spent in the United States for tires as these same countries spent for automobiles. For example, Argentina gave us 82 cents in orders for tires for every dollar spent for American automobiles, and for every commercial or passenger car sent to the Argentine approximately $1,080 was spent for tires. Another interesting fact about the Argentine export trade is that orders for American tires during 1919 were 83 times as large as the orders from the same country during 1914. The value of our exports to Brazil in 1919 was 56 times that of 1914, the exports to Chile ran

up to 106 times the value of those of 1914, and for every dollar spent by Chile for American automobiles during the past year approximately 79 cents were spent for tires. The value of our exports of tires to the Dutch East Indies in 1919 was 303 times that of the 1914 value, and for every automobile we sold to this section of the world we sold $304 worth of tires. In the case of British India the value of tire exports was 131 times that of 1914.

These figures might be continued, but the showing would merely amount to the same thing, and the net proof would be that the export business for the tire manufacturer is to-day decidedly worth while and that the American tire in the language of a well-known manufacturer is a "good tire." It is possible that under normal competition these percentages will not be maintained, but the great tire factories of the United States are going after world business in a determined way and there is no doubt that the volume of exports in American tires will continue to be large. In their work the tire companies are carrying the fight into the customer's own country, as even a cursory glance through foreign publications with their large space advertisements of American tire factories will show.

An automobile tire is a very valuable product and the manufacturers are making a careful study of the export situation and are producing a good package. The protection from humidity is adequate, and the opportunity presented for filling the case to its maximum is intelligently taken advantage of.

Attention has been called during the course of this discussion of export packing, to the advisability of filling up open spaces with small packaged goods, and in the case of the automobile tire a splendid opportunity is offered to fill the "hole in the doughnut." The company, to whose courtesy the author is indebted for the photographs in this chapter (see cuts pages 668 and 673) packs the "hole" snugly with the inner tube boxes, a practice that is fairly general.

The manager of the shipping department of a house

doing one of the largest international trades in a varied line of rubber goods, says as to his packing methods that there is no seal affixed to the cases and the only means used to prevent pilfering is the nailed strapping. All identification marks are kept from cases. Attention was called to the fact that in the case of this organization a nailless strapping was used for a short time, but it was found that it would not stay on the cases. Consequently a return was immediately made to the nailed strap.

This company makes a very large variety of goods and the packing is not standardized except for a few items. The goods as a rule are packed in accordance with customers' specifications and customs requirements. In shipping to Great Britain no straps are affixed to the cases, but shipments are confined to one or two of the largest steamship lines which give particular attention to the proper handling of freight.

It is commonly believed that a method of reducing the space occupied by a package consists in putting the cleats or battens on the inside of the case. The concern under discussion, however, states that it tried this method but found that the support given the cases was not as satisfactory as when the cleat or batten was on the outside.

This company is constantly experimenting with two-way shipments, or shipments sent out to be returned in the original cases in order to check results of the packing method, and very close touch is kept with its different foreign branches so that the success or failure of the various packings may be determined. In addition to following the instructions of customers, or the requirements of local customs regulations, a great deal of the packing is done along lines advised by the different branches overseas.

There is a further thought that operates in the work of this company. It has been found that in many countries it is possible to sell cases for two or three times their original cost. This factor reduces quite materially the cost of packing, and also makes possible a more ex-

pensive package than might otherwise be used. It also explains the preference of the company for cases rather than bales.

Another large shipper states: "The question of export packing is a pretty large one and must be dealt with individually, no fixed rule being applicable to all commodities.

"Buyers in some countries require goods shipped in cases, while others require them shipped in bundles. Some goods are dutiable on gross weight, some freight rates are charged on cubical contents of cases, while duties on others are assessed on the net weights.

"It is therefore necessary for any manufacturer to know the laws pertaining to a particular shipment that he desires to make, and it is then up to the manufacturer to arrange his packing in the most advantageous way for his customer.

"As regards automobile tires and tubes, we ship them both in bales and in boxes. Great care must be taken in each instance to guarantee safety in delivery, to avoid damage, to insure against pilferage and injury which may be sustained by the use of grappling hooks, draw hooks, etc.

"In arranging for our shipments in cases, we number our cases, say, from one to six. Each case has its particular cubical contents and will receive a certain number of certain sizes of tires, themselves nested in the case, and in the open parts we pack tubes, and on either side of the tires a certain proportion of advertising material, so that when the case is complete it is practically a solid mass, securely nailed and strapped with steel strapping around each edge, properly marked, after having all been placed in a so-called waterproof paper package.

"All our boxes are marked by specially cut type. We do not rely upon hand marks. We mark our boxes on all four sides and in some cases both ends, so that they are easily distinguishable in a large lot of boxes ready to go on or off ship or remain stored in a warehouse.

"Our weights are always given in both standard and

Courtesy of Chas. A. Schieren Co.

LEATHER BELTING TIED PRIOR TO BALING.

Belting tied to prevent rubbing and loosening of ends. Note method of protecting belting against rubbing of cord.

Courtesy of Chas. A. Schieren Co.

PACKING OF LEATHER BELTING.

(Left) Belting is wrapped in waterproof cloth and burlap, it is sewn with 30 ply Osprey twine. (Right) Cases contain baled rolls of leather belting.

INTENTIONAL SECOND EXPOSURE

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(Left) Belting is wrapped in waterproof cloth and burlap, it is sewn with 30 ply Osprey twine. (Right) Cases contain baled rolls of leather belting.

Courtesy of Miller Rubber Co.

PACKING OF AUTOMOBILE TIRES.

Shows method of nesting tires in case 42 x 40 x 32". Note waterproof paper lining. Lid is pressed down, thus economizing space.

Courtesy of Miller Rubber Co.

CASING OF AUTOMOBILE TIRES.

Another method of packing tires. In this instance tires are too large to be nested as shown in previous illustration.

kilo weights, and our marking is necessarily very clear. Our boxes are all made of 7/8" surfaced on one side material with a reënforcement in each corner, securely nailed with cement-coated nails."

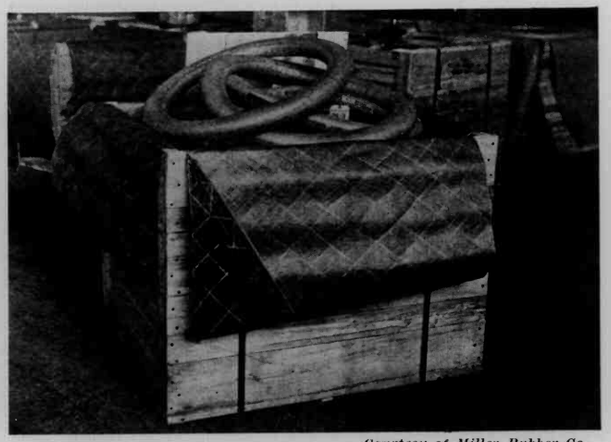
Bath Tubs and Sanitary Ware.—The following is an excerpt from a letter received from a prominent manufacturer of sanitary installations who does a large export business: "Packing as related to export shipments is one of the most important steps in building up a permanent and lasting export trade. It is the finishing touch of the manufacturer's effort to supply our foreign trade with his product, and for this reason should have the most careful attention of any operation in the process of manufacture and completion of the order.

"Aside from this viewpoint, it must be considered that an export shipment receives exceptionally rough handling, is subject to various climatic conditions, different methods of handling and transhipment at times. The manufacturer who tries to use the same packing for export as domestic business is making a grave mistake and adding to the bad reputation which the careless American exporter has acquired abroad.

"Our products, sanitary bathroom and plumbing fixtures, are carefully crated in open slat crates but with the slats not more than 1½" or 2" apart. The lumber used in the manufacture of crates is heavy 7/8" stock, and the greatest care is taken when the ware is packed in the crates that it will take up the least possible space and yet stand the unusually rough handling to which export shipments are subject. Packing is as much a trade as carpentry, and no definite instruction can be given, as circumstances and article to be shipped alter the case. However, it is advisable to put the best packers in an organization on export shipments. All crates should be iron strapped with at least a 5/8" tough band strapping, and it is advisable to use a special instrument to draw these bands tightly around the crate.

"The subject of marking crates for export shipment is an important one. Marks should always be stenciled

INTENTIONAL SECOND EXPOSURE



Courtesy of Miller Rubber Co.

PACKING OF AUTOMOBILE TIRES.

Shows method of nesting tires in case 42 x 40 x 32". Note waterproof paper lining. Lid is pressed down, thus economizing space.

Courtesy of Miller Rubber Co.

CASING OF AUTOMOBILE TIRES.

Another method of packing tires. In this instance tires are too large to be nested as shown in previous illustration.

kilo weights, and our marking is necessarily very clear. Our boxes are all made of ⅞" surfaced on one side material with a reënforcement in each corner, securely nailed with cement-coated nails."

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"The subject of marking crates for export shipment is an important one. Marks should always be stenciled

plainly—never put on 'free hand' with a marking brush, and a waterproof ink must be used. Each package should contain the customer's name or initials, port of entry, serial number on each crate as a rule, measurements in inches and net and gross weights in kilos if to a Latin country. If the destination is an inland point, both the inland city and the port of entry should be marked on the packages, as, for example, Paris via Le Havre, or Camaguey via Santiago. It is difficult to give definite instructions which will hold good on all shipments, but the above will give a general impression of the ordinary export shipment, and the improvement of each particular case is up to the individuals concerned."

Another exporter of bath tubs and plumbers' supplies states: "Bath tubs we nest three to six in a crate strongly reënforced and bound with wrought iron bands. Miscellaneous fixtures, supplies and plumbers' brass goods we pack in barrels with reënforced heads.

"We use great care in packing enamel ware and this class of material, and the few complaints we have received convince us our policy as regards packing for export is well worth the care we exercise."

A third manufacturer writes: "All roll rim bath tubs can be nested with as many as six tubs to one crate.

"All of our enamel iron lavatories with the exception of those having pedestals and legs can be packed two to a crate. In some instances where a number of these lavatories are ordered, we pack several legs in one crate. Regarding our vitreous china lavatories, the same packing is advised.

"Our roll rim slop and kitchen sinks are crated two to a crate, but the flat rim kitchen sinks can be nested six to a crate.

"All plain bowls for closet combinations are packed two to a crate, the tanks for each low type combination being packed separately; the supply pipes and other brass fittings are packed together in one box, with the seats for all combinations packed together in another box. These boxes are securely packed and closed so that none of the fittings can slip out.

"Our flat back, sanex and roll rim urinals can be nested two in a crate in a very small cubic space.

"We would state that our ware is packed in open crates for export shipment, as we have experimented with the open and closed cases and have found that less damage occurs in using the former method, the steamship people can see the contents and greater care is taken in handling shipments."

Yet another large shipper writes: "It is customary for us to box all material for export with the exception of competition style baths, which we crate. Our boxes consist of lumber of ½″ thickness at top and bottom, and ¾″ thickness on the sides. The fixtures are braced inside to prevent their rocking. These braces vary in number, according to the size of the fixture; they are made of 1″ lumber. Between the fixtures themselves and the wooden packing we use excelsior pads; these pads also vary in size; they average in their original state about 2″ thick. Our packages are then strapped with iron bands.

"Our crates are built on more or less the same principle—the same thickness of lumber as mentioned, and with the use of braces and excelsior pads inside, and on some styles of bath tubs we also use additional felt pads to protect the rims. This latter additional packing is particularly used on baths which are nested, that is to say, which are packed two or more in a crate. In these nests the weight of each bath is carried on a skeleton frame so that each fixture rides independently of the other, and the total weight of the contents of the crate is carried by the exterior packing."

It should be noted in the shipment of bath tubs and sanitary ware that no little attention should be given to the customs regulations of the country of destination. It is almost always preferable that all nickel fittings, faucets, etc., be packed separately from the porcelain or cast iron fixtures, and properly and separately declared in accordance with the laws of the country of destination.

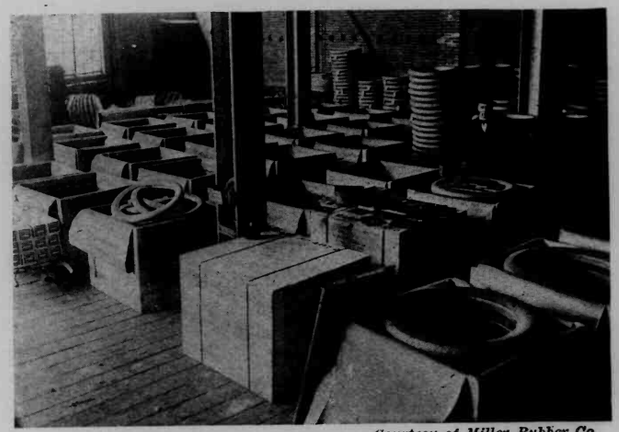
Oil Cloth.—A well-known exporter of oil cloth states:

"The method of packing oil cloth depends largely upon the quality of goods shipped, but all kinds are prepared for packing in the same way, that is, the cloth, which is about fifty inches wide, is wrapped around a wooden pole or dowel, forming a close roll.

"The rolls are usually packed beside and on top of each other in wooden cases. The cases are not lined, unless especially requested by the customer, in which case the extra protection is paid for by him. Two kinds of cases are used: light cases for shipping to ports near at hand; heavy cases for shipping to more distant ports. The light cases are built usually of 13/16″ lumber. The ends, or heads, are reënforced with two cleats three inches wide and 16/16″ thick, one at either side of the head and flush with the sides of the case. Wire straps, ⅝″ wide, are nailed to the case close to the head, so that the nail drives through into the head as well as into the top of the case. Heavy cases are still more strongly reënforced. Four cleats instead of two are used, forming a square of cleats all around the head; sometimes these cleats are square cornered, sometimes mitered. Also, two sets of battens are nailed around the case, one about a third of the way from each end. Wire straps are nailed to the battens.

"Rolls of goods of especially high finish, such as the smooth black or colored glazes, are prevented from scratching in the following manner: the inside of the case is recessed by nailing a strip of wood to each end, laying the ends of the poles upon it and then nailing another strip of wood just above the ends of the poles. If the size of the order is such that there must be more than one layer of rolls in the case, then another recess is built a few inches above the first. To prevent rolls in the same layer from pressing too closely upon one another, each pole has its own individual recess, the strips of wood being hollowed out in opposite semi-circular grooves forming a separate circular groove for the end of each pole."

Bicycles.—According to a prominent international



Courtesy of Miller Rubber Co.

PACKING OF INNER TUBES.

To economize on space, boxes containing inner tubes are placed in centre of tires.

Courtesy of Robt. H. Ingersoll & Bro.

PACKING OF WATCHES.

Each watch carefully wrapped is placed in box; individual boxes are placed in cartons of twelve each. Note that at least one inch is left on all sides of case for paper packing.

INTENTIONAL SECOND EXPOSURE

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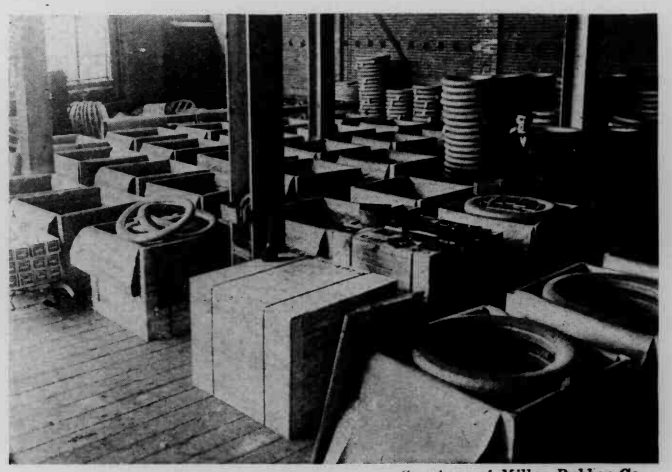

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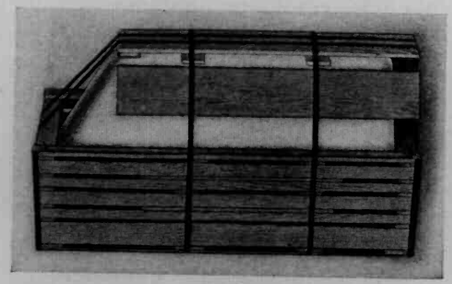


Courtesy of Pacific Sanitary Mfg. Co.

CRATING OF BATH TUBS.

As many as six roll rim bath tubs can be nested in one crate.

Courtesy of Thomas Maddock's Sons Co.

SANITARY WARE PACKED FOR SHIPMENT.

Carefully crated in open slat crate, slats are not more than 1½" or 2" apart.

shipper, "there are two methods of exporting bicycles. Some distributors strip the frames entirely, shipping the bicycle frames in crates and all equipment in cases. We do not advocate that plan ourselves, believing that it costs more for ocean space when the wheels of the bicycles are boxed together with the accessories.

"We have found almost universal satisfaction in shipping our bicycles in crates, one machine to a crate and then we fasten four crates together, putting extra straps of tough wood around the four crates, supported with steel strapping. We strip the bicycles before crating them in the following way: The handle bars, pedals, saddles and stems are removed. These are packed and shipped as accessories in a separate box. The bicycle stands in the crate upon the rubber tires which are inflated. The enamel frames are carefully wrapped according to the spiral method with tough paper. This paper must not be too stiff but must conform closely to the part wrapped. All bright parts of the bicycle should be heavily vaselined to prevent rusting or corrosion by sea fog and moisture.

"Bicycles shipped in that way take up the minimum space. They are easily handled, as four machines crated together will not make a package of a total gross weight of over 300 pounds. The crates are so made that the wood strips of which they are composed afford adequate protection to the machines or contents.

"In some instances, where we know the machines are going a long distance, for instance, to India and then up country, we have removed the rubber tires from the bicycles and shipped them in separate case. We do not regard this as a necessity, ordinarily, unless there may be a possibility of a long exposure of the rubber to artificial heat in the steamer or a trip overland, as standing in the sun will affect the rubber."

Watches.—Among the products of the American factory that have won an enviable place for themselves in the trade of the world the story of the watch offers a great deal that is significant and informative. The mer-

chandising methods of the American watch manufacturer are not alone novel and aggressive but they are based on quality goods and the argument is a quality argument.

The export development has brought with it close attention to the requirements of a good export package, and the success attained proves that the problem has been practically solved. The author can remember being shown, several years ago in Europe, an export package of American watches, and the French jeweler who displayed them stated that it was the most satisfactory export packing method with which he was acquainted.

Since this time great improvement has been made, to such an extent that last year one American watch company shipped 9,000 packages of various types and styles abroad and the complaints for "ill packing could easily be counted on one hand and our claim losses for theft, etc., as far as the writer can understand, were less than five."

In connection with shipments of watches reference should be made to the special chapter on parcel post shipments as well as observations elsewhere in this volume relating to the protection of all shipments against pilfering.

With reference to export packing of watches a well-known house sends us photographs (see page 673) and states: "Our watches are placed first in individual boxes, either so wrapped with tissue paper that there is no play in the box or lying in a nest in the box which prevents the watch banging against the side of the box. The individual boxes are then placed in cartons holding twelve each and packing is placed between the sides of the individual boxes and the side of the carton which cuts down the play to a minimum.

"If the shipment is to go by freight, the watches are packed in a heavy wooden case, which is first lined with a tar-lined paper bag. At least one inch space is left at all sides of the case for packing. After the case is nailed, wire strapping is put around the center and ends. Tin-lined cases are furnished at cost, if desired."

Describing its export packing methods, another company doing a very large international business writes as follows: "We never use second-hand cases, all cases being constructed to fit the merchandise shipped rather than trying to make the merchandise fit into whatever cases we happen to have. This, of course, means extra expense, but when you figure that a customer wishes his merchandise delivered to him in proper condition and does not look for broken or damaged material, the slight extra cost in packing is more than compensated for by a satisfied client.

"Our heavier material, such as clocks and automobile parts, are packed in ⅞" pine stock cleated at each end and set in tin lined, hermetically sealed cases, the outside of the case being nailed with from seven to nine nails and the case strapped with iron strapping at each end and around the middle. These cases are strapped in such a way that should they drop on any one corner, as cases are apt to do, they will not split open, the nailing and cleating being such that all goods are protected."

Silverware.—In reference to export shipments of silverware a well-known house writes: "Our cases are always of new lumber ⅞" in thickness—average size of the case 28" x 13" x 12" and should we use a larger size case, it is double cleated at the ends. The contents of the case are protected by a covering of heavy waterproof tar paper which is sealed tight before the cover of the case is put on."

Further reference to shipments of silverware and similarly valuable merchandise are to be noted in connection with advice elsewhere given relating to protection against pilfering.

Hats.—A letter received from a large exporter says: "All hats, whether for export or domestic shipment, are first packed in round paseboard cartons, from one to six hats being packed in each. The hats are held in place in the cartons by a pasteboard stay placed between each hat. Strips of tissue paper are also placed between each hat to prevent rubbing. The process of this inner pack-

ing is completed by covering the entire top of the carton with tissue paper before the lid is put on.

"Export shipments by freight. The cartons are packed in cases made of new, sound lumber of a thickness of 5/8", strengthened by a batten 3" wide and 7/8" thick, around the entire ends of the case. The case is lined with waterproof paper and is further protected with Glardon clips and angle irons. The angle irons are placed around both ends of the case at a distance of about 6" apart. The case is completed by placing an iron strapping 1" wide securely around both ends.

"This is our usual method of packing our export shipments for freight, but on shipments to the Argentine Republic and to the West Coast of South America, and South Africa, in addition to the above, the case is lined with zinc, the top and bottom being soldered so that it is absolutely waterproof. Apart from the question of expense, this we consider the best method of packing.

"In shipping to countries where the duty is levied on the gross weight, the question becomes one of lightness consistent with safety. For these countries we use a veneer case protected by battens and iron straps as described above.

"We also ship in zinc or tin cases crated with wooden slats placed about 6" apart all around the case."

Moving Picture Films.—Except to Brazil and England, moving picture films are packed as follows: Each reel is wrapped with tissue paper and placed in a tin container about 10½" in diameter. The cover of the container fits down tight, but it is not sealed or fastened in any way. On each container is pasted a label giving the title of the film and the number of the reel.

The containers are packed one on top of the other in a square case of North Carolina pine 7/8" lumber. From five to thirty-two containers are packed in a case, according to the size of the order. The case is lined with tin and after the containers have been packed, a piece of tin is soldered on to the top edges of the lining for a cover. The lining consists simply of square pieces of tin, one to

every side of the case and overlapping at the corners and sealed, the top edges being bent inward about an inch to support the tin cover. The cover of the wooden case is then nailed on, two opposite sides of the case are cleated, and two wire straps are nailed around the case near the edges.

Almost the same method is used in packing for Brazil, but no tin containers are used, since there is a duty of $10 each on such cans in that country. Each reel is first wrapped in tissue paper, then in waxed paper, and the reels are then laid on top of each other in the tin-lined case.

Films going to England are packed in galvanized iron cases with wooden lining about one-quarter of an inch thick. Only seven reels are packed in a case. The cover is hinged and has two padlock fastenings and on top of the case is a handle for convenience in lifting. The wooden lining of this case is fastened into the tin with bolts.

Picture Moldings.—A large exporter of picture moldings writes: "In taking up this matter in detail, we find that due to the different methods and customs prevailing, especially in some of the South American countries, we have to adopt three methods of packing: First are the standard sized wooden cases which are used generally; second are our special wooden cases of short lengths or light weight for shipment to South American countries where transportation is usually by pack animals; third, packing in bundles for shipment to countries where duties are paid by the gross weight.

"Standard method of packing. As our moldings all run in three standard lengths, namely, 8′, 10′ and 12′, we have standardized the largest percentage of our packing in three cases of the following dimensions: Box No. 1—outside measurement is 8′ 6" x 26" x 14"; inside 8′ 2" x 24" x 12". Box No. 2—outside 10′ 6" x 26" x 14"; inside 10′ 2" x 24" x 12". Box No. 3—outside 12′ 6" x 26" x 14"; inside 12′ 2" x 24" x 12". The sizes of the above boxes are practically the same on all shipments, due to

the fact that the majority of the molding is sold in large quantities and each pattern or similar patterns can be packed together.

"Both ends of these boxes are made of two thicknesses of inch lumber; the sides are of one-inch lumber and the top and bottom are cleated with strips 4" x 1", the open places between cleats being boarded up solid with one-half inch birch lumber, which we find the most satisfactory for making cases, as it is very tough.

"The boxes are lined with heavy waterproof paper, and the molding is packed solid so that there will be no play or shifting inside of the boxes. After the box is packed it is then strapped with steel fasteners.

"When large moldings are packed in cases, they are always tied two together face to face with excelsior cushions in between, as large moldings are not so easy to pack solidly and have a greater tendency to shift in the box, thus rubbing the faces and spoiling the molding.

"We can give no standard weight of these cases, but they will average from 550 to 750 pounds each, depending upon the kind of molding packed in same.

"Second special method of packing wooden cases. These cases are made the same as the above with the exception that they are limited to 5-foot lengths and to 160 pounds gross weight. These are for shipment principally to Colombia, South America, where it is necessary to transport cases overland via pack mules."

To some countries, especially countries in Latin America, and above all to Venezuela, where duties are paid on the basis of gross weights, picture moldings are sometimes shipped in bundles, to which reference is made in the special chapter devoted to shipments of that description.

CHAPTER XXVI

FOREIGN PARCEL POST SHIPMENTS

WITH the extension of our parcel post conventions throughout the world, the United States will doubtless soon be able to place at the disposal of shippers the same facilities which the United Kingdom has for many years been able to offer to exporters in that country. Shipments by parcel post are in many cases to be preferred to other forms of shipment, because of the lack of formalities and the ease of passing such packages through custom houses and comparative quickness of transmission. Again, there are a great many commodities usually sent out in small packages for which the parcel post is an ideal, in fact, an essential way of shipping.

In 1913 parcel post packages could be sent from the United States to only forty-four countries of the world, and the limit of weight was eleven pounds. Today the American parcel post service extends to more than one hundred and eighty nations and colonies, and to fifteen of these countries one may send parcels up to twenty-two pounds in weight and to one, Panama, up to fifty pounds. In 1912 there were dispatched from the United States 2,270,215 pounds of export parcel post matter. In 1913 there was an increase of 600,000 pounds and in 1914 about 500,000 pounds.

Immediately after the signing of the armistice, our Post Office Department concluded parcel post arrangements with eighteen foreign countries with which there had been no conventions up to that time, and some of the very important markets of the east, south and west were opened up to American foreign parcel post business. In rapid succession came conventions with Spain and her colonies and with Great Britain and France whereby the American parcel post system was extended to every coun-

try in the world which was reached by the parcel post arrangements of these two nations. In a very short time our service was extended to about one hundred and eighty countries as against forty-four in 1912. The volume of matter sent by parcel post shows a corresponding increase, namely, from 2,270,215 pounds sent in 1912 to 17,102,131 pounds in 1919. In the first quarter of the fiscal year of 1920 the post office sent out more than 6,000,000 pounds by parcel post or more than was dispatched in the combined years of 1912 and 1913. Indeed, so great has the volume of foreign parcel post business become that our Post Office Department will probably ask for a deficiency appropriation of at least $1,000,000 to pay for the increased cost of steamship transportation.

Since the whole question of packing for foreign parcel post shipments primarily depends upon the parcel post arrangements of the country of destination and the convention of our own country with that other country, the very first step in filling an order is to investigate these regulations. Shippers should always have close at hand for ready reference the latest edition of the United States Official Postal Guide. This is published in the form of a cloth bound volume in July of each year, and there are monthly supplements which keep detailed information and the official instructions up to date. The annual subscription to the Guide with supplements is $2.25 and the source of supply the Post Office Department, Washington, D. C. Shippers who are not in possession of the Official Postal Guide will always find it and its monthly supplements available for consultation at their local post offices.

The regulations affecting the dispatch of parcel post packages to foreign countries are numerous and vary with the different countries of destination. Sometimes regulations define the merchandise which is prohibited for transmission to certain countries. Occasionally there are instructions as to certain special packing which is obligatory as regards some commodities. Special sizes and weights of parcels which are allowed and the rates of postage which apply to shipments to all countries are

enumerated. In the case of a few countries parcel post packages may only be addressed to certain specified cities or post offices. Regulations also refer to the necessary customs declarations and in a few instances to the consular invoices which must accompany packages shipped by parcel post. All of these instructions will be found clearly set forth in the Official Postal Guide under the heading of the countries of destination, and should be carefully investigated in the case of each parcel post shipment.

When to Use Foreign Parcel Post.—In general, small quantities of merchandise may preferably be forwarded by foreign parcel post whenever individual units of shipment come within the weight limits of 11 pounds, or 22 pounds, or whatever the official limit may be for the country of destination. Individual units, or any combination of them, can be packed in a parcel, the weight of which must not exceed the official limit. Any number of such parcels can be dispatched to cover the quantity to be forwarded. Up to a certain point it will usually be found cheaper to forward limited quantities of merchandise by parcel post than by freight or by the so-called "foreign expresses," and as has above been hinted, parcel post shipments arrive as promptly, to say the least, as do freight shipments. When, however, it is a question of shipping a considerable quantity of merchandise, the point will ultimately be reached when freight rates or "foreign express" rates for the quantity of merchandise in question will compare more than favorably with the parcel post charges. In this connection it is to be borne in mind, that in some countries there is a delivery charge imposed on the consignee applying to each parcel post package in addition to the United States postage which has been prepaid, and in some countries there is a surtax which the consignee must pay, in the case of Australia amounting to 12 cents per parcel, over and above other charges. Considerations such as these may affect the shipper's choice of the means by which he will forward his goods to the best satisfaction of his customer.

It may also here be pointed out that samples of no commercial value ought not to be dispatched by parcel post unless such samples have been specifically requested by foreign merchants. When a parcel post package arrives in a foreign post office, if it contains dutiable goods, the consignee is called upon to pay the usual import duties. He will not be pleased to do so if a sample has been sent without his knowledge or permission, at least, unless the sample is something which he wants, and may very likely refuse to take delivery of the parcel. Shippers may be reminded that there is available the "sample post" which is preferable for use when samples have no commercial value and weigh less than 12 ounces. Similarly, advertising matter and catalogues should be sent preferably as "printed matter" rather than by parcel post in order to avoid excessive customs duty charges. On the other hand, it is sometimes prohibited to ship valuable articles in the regular mails. Fountain pens shipped to Japan are subject to duty in that country and will not be accepted in the regular mails from the United States but must be forwarded by parcel post.

General Regulations.—While quite impossible in this chapter to reprint the elaborate and detailed regulations applying to foreign parcel post shipments, it may be desirable at this point to resume briefly a few of the general instructions issued by the Post Office Department.

A parcel may not be posted in a letter box or package box but must be taken into the post office or post office station and presented to the officer or clerk in charge.

The postage in all cases must be prepaid by means of postage stamps, which must be affixed to the parcel. The general postage rate is 12 cents for each pound or fraction of a pound, consequently if a parcel weighs even a quarter of an ounce over a pound, another full rate must be prepaid or the parcel will not be dispatched from the United States. The general rate of 12 cents per pound, or fraction thereof, is broken in exceptional cases, applying to parcel post packages intended for a good many countries which are reached from the United States

by dispatch from here through the intermediary of another country (for example, Great Britain or France), and charges for the transportation over the territory of the other country are therefore imposed by it. Such charges, in addition to the postage, must be paid by the senders by means of United States postage stamps affixed to each parcel post package concerned at the time of mailing.

Customs duties on parcels which may be imposed by foreign countries of destination cannot be prepaid by the senders in this country. They are collected from the addressees when the parcels are delivered. An exception to this rule is found in the provisions for the prepayment of customs duties on catalogues and advertising circulars shipped to Australia and the Union of South Africa.

Printed catalogues or other advertising circulars are subject to customs duties in Australia and the Union of South Africa, even when forwarded in single copies addressed to individuals, when the weights of such packages exceed certain specified limits. This is a very important matter to manufacturers who wish to get their catalogues into the hands of possible buyers of their goods in these countries, without imposing a penalty on their prospective customers for the privilege of receiving the manufacturer's advertising matter. There are also duties on catalogues and printed advertising material in Canada, New Zealand and other countries of the world, but such duties apply to bulk shipments, and such shipments are usually to be regarded as similar to shipments of general merchandise and the same necessity does not exist of landing in the hands of the addressees without charge. The duty on catalogues sent to Australia and South Africa may, unlike any other kind of customs duties, be prepaid by the sender in this country in the following ways: In the case of Australia, customs duty stamps may be purchased from the Australian Customs Representative in New York City, from whom also full information, the details of the duty required by different weights of packages, etc., may be obtained. In the case of the Union

of South Africa, the shipper in this country may obtain customs duty stamps of that Union from the office of the High Commissioner of the Union of South Africa, 72 Victoria Street, London, S. W. Details as to the amounts of duty to be thus prepaid will be found in the United States Official Postal Guide.

Any article absolutely prohibited admission to the regular mails for any country is also inadmissable to parcel post mails for that country, but no article is excluded from parcel post mails solely because it is dutiable in the country of destination.

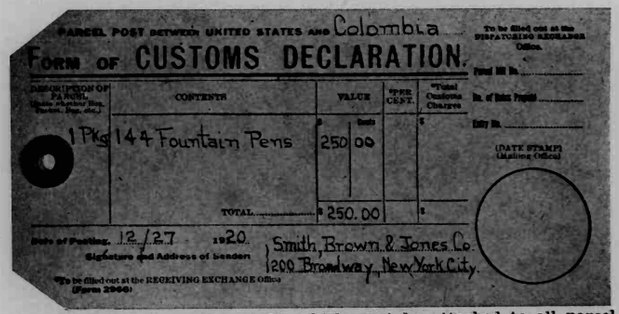
A letter of communication of the nature of personal correspondence must not accompany, be written on or enclosed with any parcel, but an open bill or invoice may be enclosed in a parcel.

"No parcel may contain packages addressed to persons other than the person named in the outside address of the parcel itself." This official regulation, it should be noted, applies to 'addressed' packages within a parcel. There is nothing in the regulations to prohibit the sending of several packages separately wrapped and serially numbered, within a general parcel even when these separate packages may be intended for different consignees, in regard to which a separate letter to the original consignee of the whole parcel may have given instructions regarding separate deliveries.

Parcel post packages are only accepted for transmission to certain specified cities or post offices in the case of a few countries of the world. In general, the parcel post system reaches all post offices in countries to which the parcel post extends. However, notably in China and Brazil (see official regulations), there are comparatively few points to which the parcel post is delivered. If it is desired to ship parcels intended for other destinations in these countries than the cities officially listed, then arrangements must be made with the consignees in those countries to take delivery of such parcels at the officially designated post offices. The United States Post Office Department will not accept parcels for destinations in

Brazil outside of seven specified post offices in that country, unless the address side of each such parcel is marked "Sender's Risk" or "Delivery Arranged."

Registration of Parcels.—Parcel post packages for most countries of the world may be registered (for exceptions see Official Postal Guide), and whenever possible they should be registered. Shippers of parcels to most countries for which registration is possible may, if they so request it, receive a return receipt from the addressee of the parcel without special charge therefor. Furthermore, and a point which is not always understood by all shippers, even when parcels are not registered, the sender


PARCEL POST BETWEEN UNITED STATES AND Colombia

FORM OF CUSTOMS DECLARATION.

CONTENTS	VALUE	PER CENT.
1 Pkg 144 Fountain Pens	250 00	
TOTAL	250.00	

Date of Posting 12/27 1920

Signature and Address of Sender: Smith, Brown & Jones Co. 200 Broadway, New York City.

Customs Declaration, Form 2966, which must be attached to all parcel post packages for foreign countries.

may obtain a receipt from the United States post office for the packages which he delivers to the post office for transmission by foreign parcel post mails. The office of mailing will, if requested, fill out and date stamp a "certificate of mailing" without charge, and it will supply duplicate and triplicate of the same certificate at a charge of one cent each. These proofs of actual mailing of parcels may be extremely important and even valuable.

Insurance of Parcel Post.—The official regulations declare that "parcel post packages to foreign countries (including Mexico and Panama) cannot be insured." It should be understood, however, that this official regula-

INTENTIONAL SECOND EXPOSURE

of South Africa, the shipper in this country may obtain customs duty stamps of that Union from the office of the High Commissioner of the Union of South Africa, 72 Victoria Street, London, S. W. Details as to the amounts of duty to be thus prepaid will be found in the United States Official Postal Guide.

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PARCEL POST BETWEEN UNITED STATES AND Colombia

FORM OF CUSTOMS DECLARATION.

To be filled out at the DISPATCHING EXCHANGE Office.

Parcel Bill No. .....

DESCRIPTION OF PARCEL (State whether Box, Packet, Bag, etc.)	CONTENTS	VALUE $ Cents	*PER CENT.	*Total Customs Charges $
1 Pkg	144 Fountain Pens	250 00		
	TOTAL.....	$ 250.00		$

No. of Rates Prepaid .....

Entry No. .....

(DATE STAMP) (Mailing Office)

Date of Posting. 12/27 1920

Signature and Address of Sender: Smith, Brown & Jones Co. 200 Broadway, New York City.

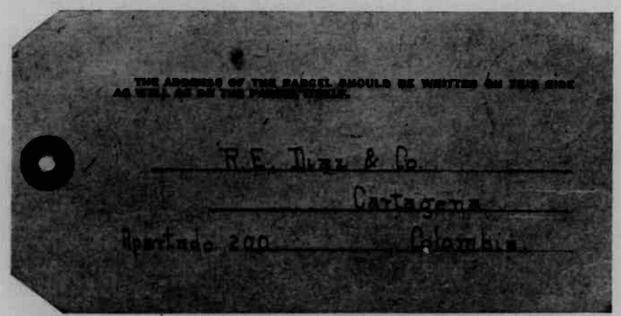
*To be filled out at the RECEIVING EXCHANGE Office (Form 2966)

Customs Declaration, Form 2966, which must be attached to all parcel post packages for foreign countries.

may obtain a receipt from the United States post office for the packages which he delivers to the post office for transmission by foreign parcel post mails. The office of mailing will, if requested, fill out and date stamp a "certificate of mailing" without charge, and it will supply duplicate and triplicate of the same certificate at a charge of one cent each. These proofs of actual mailing of parcels may be extremely important and even valuable.

Insurance of Parcel Post.—The official regulations declare that "parcel post packages to foreign countries (including Mexico and Panama) cannot be insured." It should be understood, however, that this official regula-

tion applies only to government insurances. All parcel post packages may be insured through certain marine insurance companies, some of which specialize in this form of insurance. The matter of insurance should be carefully considered in packing, for the average insurance policy contains a clause limiting the company's responsibility per package, that limit usually being lower for countries to which packages cannot be registered. This limit ought never to be exceeded by the value of the goods because in case of loss the insurance company's responsibility is limited to the amount of the policy. On this



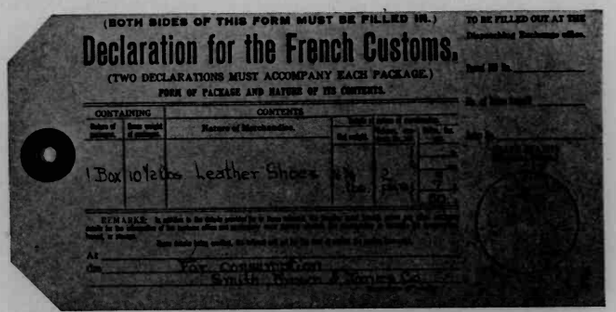
Reverse side of Form 2966.

account, it is often advisable to pack a consignment in several separate packages, even though otherwise one package alone might have been sufficient.

Customs Declarations.—A "Customs Declaration," Form 2966 (which will be furnished on application at the post office or station), must be properly and fully filled out, stating the actual contents, value, etc., of the parcel. General terms such as "merchandise" or "samples" will not answer; contents must be accurately described in the English language, although an interlineation in another language, if desired, may be furnished. The "Customs Declaration" must be firmly attached to the cover of the parcel, but not pasted or affixed so that it will seal the

package and prevent examination of the contents without damaging the cover. In addition to being tied by means of a cord passing through the eyelet, the tag should be bound flat to the parcel (with the front or "declaration" side facing out) so that the tag cannot be used as a handle to lift the package while in transit.

A special "Customs Declaration," Form 2967, must be attached to parcels for France and certain French colonies, in addition to the regular Form 2966. In the case of some countries two or more copies of the Customs Declaration, either Form 2966 or Form 2967, are required.



Special Customs Declaration, Form 2967, which must be attached to all parcel post packages for France, in addition to Form 2966.

Customs Declarations take the place of certified invoices in most parcel post transactions, and they must therefore accurately describe the contents of parcels, and state their exact and correct value. Much complaint has been received from foreign post offices as to the incorrect declaration of the contents of parcels. The values must be the current values of the finished articles. Over-valuation involves expense and inconvenience to the addressee; under-valuation leads to the confiscation of the parcel and its contents. Each parcel must have its own Customs Declaration attached, describing the contents and giving the value for that individual package, and no package will

INTENTIONAL SECOND EXPOSURE

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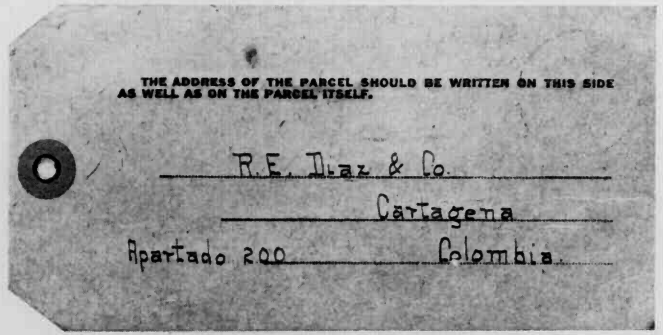

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(BOTH SIDES OF THIS FORM MUST BE FILLED IN.)

Declaration for the French Customs.

(TWO DECLARATIONS MUST ACCOMPANY EACH PACKAGE.)

FORM OF PACKAGE AND NATURE OF ITS CONTENTS.

TO BE FILLED OUT AT THE Dispatching Exchange office.

Parcel Bill No. _____

No. of Notice Prepaid _____

Entry No. _____

(DATE STAMP) (Mailing Office.)

CONTAINING		CONTENTS			
Nature of package.	Gross weight of package.	Nature of Merchandise.	Details of nature of merchandise. Net weight.	Volume, numbers, No., etc.	Value. Not exceeding
1 Box	10½ lbs.	Leather Shoes	9¼ lbs.	2 pairs	lb. oz. 7 lb. 50 c.

REMARKS: In addition to the details provided for in these columns, the sender must furnish below any other necessary details for the information of the customs office and particularly must state whether the merchandise is intended for transmission, transit, or storage.

These details being omitted, the ordered will not be the best of suited the parties interested.

At the For consumption

Smith, Brown & Jones Co.

Signature of sender

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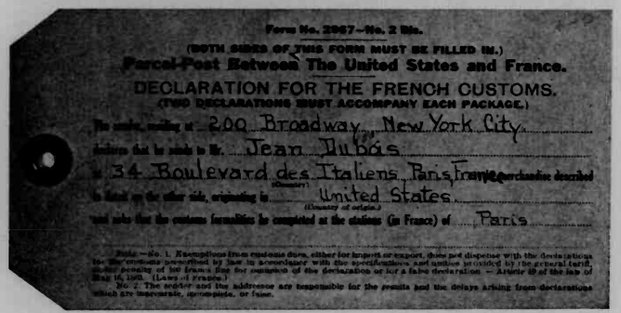
Customs Declarations take the place of certified invoices in most parcel post transactions, and they must therefore accurately describe the contents of parcels, and state their exact and correct value. Much complaint has been received from foreign post offices as to the incorrect declaration of the contents of parcels. The values must be the current values of the finished articles. Over-valuation involves expense and inconvenience to the addressee; under-valuation leads to the confiscation of the parcel and its contents. Each parcel must have its own Customs Declaration attached, describing the contents and giving the value for that individual package, and no package will

be accepted by the post office without the Customs Declaration, properly filled out, being attached.

If possible, information should be obtained from the customer as to the manner of declaring the shipment according to the laws of the country of the customer; the classifications and rate of duty on the merchandise enclosed, with the specified paragraph under which it is enumerated in the tariff laws, whenever, as is the case in many Latin American republics, penalties are imposed for wrongful declarations. The Customs Declaration tag (reproduced in this chapter) is the only formality which must be complied with in the case of parcel post shipments. No filing of shipper's declaration at custom house



Form No. 2967—No. 2 Bis.

(BOTH SIDES OF THIS FORM MUST BE FILLED IN.)

Parcel-Post Between The United States and France.

DECLARATION FOR THE FRENCH CUSTOMS.

(TWO DECLARATIONS MUST ACCOMPANY EACH PACKAGE.)

The sender, residing at 200 Broadway, New York City.

declares that he sends to Mr. Jean Dubois

at 34 Boulevard des Italiens, Paris, France, merchandise described

in detail on the other side, originating in United States.

(Country of origin.)

and asks that the customs formalities be completed at the station (in France) of Paris

Note.—No. 1. Exemptions from customs dues, either for import or export, done not dispense with the declarations by the customs prescribed by law in accordance with the specifications and notices provided by the general tariff, under penalty of the fines for omission of the declaration or for a false declaration. — Article 49 of the law of May 16, 1892. (Laws of France.)

No. 2. The sender and the addressee are responsible for the results and the delays arising from declarations which are inaccurate, incomplete, or false.

Reverse side of Form 2967.

or other similar formalities are required, as is necessary in shipping goods by freight.

No erasure or amendment should be made in the entries relating to the description, number, value, etc., of contents of the package. A separate entry should be made of each kind of article or goods, describing precisely in each instance the quality, quantity by number, measurement and net weight (in grams when packages are destined for countries using the metric system).

Addressing Packages.—Every parcel must be plainly addressed in ink, giving the name and full address of the person for whom the parcel is intended. It should bear

the words "Parcel Post" conspicuously in the upper left-hand corner and the name and address of the sender in such a position that it will not be mistaken for the address of the parcel. The standard specifications of the War Department for marking packages are worthy of note in this connection. "Marks may be applied in the form of printed labels marked with waterproof ink in letters not less than one-fourth inch high. At least two labels, containing all markings, should be glued to each package, one on each end. Such labels to be made of sulphite paper, sulphate kraft paper, or other approved paper, and should be applied with hide glue, fish glue, or casein glue. After being glued, the addressed label should be brushed over with a coating of formaldehyde."

The official post office regulations applying to parcel post shipments to Russia provide for certain special addressing which perhaps may profitably be taken into consideration in general regarding parcel post shipments. "Parcels covered with oil-cloth must be provided with a stout linen-backed label securely sewn to the cover by stitching along the edges and diagonally across the label, on which a clear space not less than 5 inches by 3 inches has been left for affixing official labels. The parcels may be addressed on the rest of the label. If addressed on the cover itself, the address must be painted on the cover, preferably with white paint. The name and address of the sender must be shown on the cover of every parcel."

All mail articles addressed in German, Russian, Greek, Turkish, Hebrew or Chinese characters, even if they bear in English, "Germany," "Russia," "Greece," "Turkey" or "China," etc., should have an interlined translation of each address in English, or in lieu of these two addresses, the names of the post office and country of destination in Roman or English characters, print or script.

Packing for Foreign Parcel Post.—There is no little complaint of insufficient packing in our own domestic parcel post mails. The necessity for extra strong and thoroughly secure packing for foreign parcel post is doubly

INTENTIONAL SECOND EXPOSURE

be accepted by the post office without the Customs Declaration, properly filled out, being attached.

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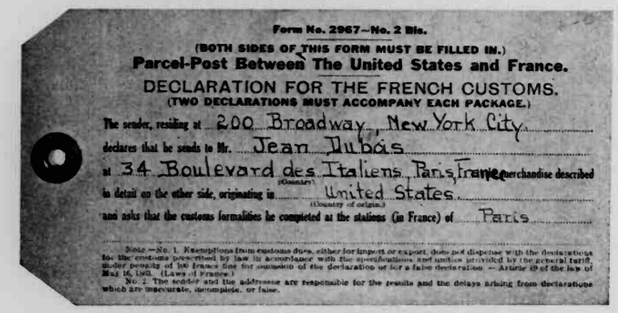

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Note—No. 1. Exemptions from customs dues, either for import or export, does not dispense with the declarations to the customs prescribed by law in accordance with the specifications and section provided by the general tariff, under penalty of 500 francs fine for omission of the declaration or for a false declaration. — Article 49 of the law of May 16, 1903. (Laws of France.)

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Reverse side of Form 2967.

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Packing for Foreign Parcel Post.—There is no little complaint of insufficient packing in our own domestic parcel post mails. The necessity for extra strong and thoroughly secure packing for foreign parcel post is doubly

to be emphasized. In the past few months repeated complaints have been received by the United States Post Office as to the condition in which our parcel post packages have arrived at foreign destinations. It is alleged that at one time 500 damaged packages were received in London from this country, damaged in consequence of poor wrapping and packing and improper preparation for transmission overseas. Similar complaints have been received not only from far distant points like China and Australia, but from Central America and even from Canada.

In the first place, it should be understood by shippers that our parcel post mails are usually sent from this country in ordinary mail bags. Some European countries ship their parcel post packages in hampers and cases. This is sometimes done in the American mails but more frequently ordinary mail sacks are employed. A hamper or a case protects the packages within from rough handling. There is no such protection when mail bags are employed, which are thrown about in the way to which everybody is accustomed: from the mail wagon to the wharf, from the wharf, into the ship, with scores or perhaps hundreds of other bags and packages on top, lugged and dragged about and finally stored on board ship, which, when it arrives at the foreign port, reverses the operation and the sacks are thrown helter-skelter and violently from the ship on board a lighter or on to a wharf, with the natural and inevitable consequence that all light parcels included in these bags, whether made of wood or pasteboard, are morally certain to be damaged if not completely smashed and their contents possibly lost or destroyed.

The natural disposition of a shipper is to pack a parcel post package as light as possible in order to save postage, but only soft articles which will stand crushing should ever be shipped in any containers not strong enough to stand up under the rough usage just above described, no matter if a few cents' extra postage is required to carry the heavier, stronger container. It must

be remembered that the friction resulting to articles contained in sacks stored in the mail rooms of ocean steamers is considerable, and even wrapping papers for newspapers and magazines should be much stronger than is normally required in our domestic mails.

Another preliminary consideration in connection with the packing for foreign parcel post mails is the destination of the package and the treatment which it is likely to undergo in country or destination. In some foreign countries, in China, perhaps, parcel post packages are carried for as much as fourteen days on camelback. In Central American countries mails for interior points are sent on muleback, frequently involving trips of from three to six days, fording rivers and exposed to tropical rain storms. Sacks have to be roped tightly to the animals which transport the mails to prevent their slipping, and the ropes are quite sure to crush any light packages contained within the sacks, while the necessity for waterproof protection is even more emphatic in the case of parcel post shipments than it is in the case of regular freight shipments.

Packages Presented Open for Inspection.—The post office regulations provide that every package must be securely and safely packed so that it can be safely transmitted in ordinary mail sacks, and it must be so wrapped or enclosed that its contents can be easily examined by postmasters and customs officials. Boxes with lids screwed or nailed on may be used and bags closed by means of sewing, providing they are presented at the post office open for inspection and are then closed by the sender. There are, however, three or four countries for which parcels are accepted by the post office for mailing even though they are sealed and closed against inspection, providing they conform to other prescribed conditions. This means that as a rule the outside box or other container must be easily opened for inspection, and that small boxes or packages enclosed in the outside container must also be easily opened or their contents otherwise readily inspected.

For example, a prominent manufacturer of fountain pens doing a very large parcel post business has an interesting method for packing his pens in cardboard cartons containing from six upwards. This manufacturer uses a so-called "outlook box" in three sizes, containing six, nine and twelve pens. The box has two openings in the cover through which the quantity of pens and clip caps may be checked without the unsealing of the carton. The upper opening shows the clip, the lower shows the holder. To prevent pilfering and unjust claims, each carton is sealed with a band bearing a list of its contents. The individual pen boxes in which fountain pens are usually sold are placed empty in layers on the top and bottom of the "outlook box," thus forming a cushion which is an added protection in shipping.

This feature is covered by the official regulations which read: "The presence in an unsealed parcel of sealed receptacles containing mailable articles which cannot be safely transmitted in the unsealed receptacles will not render the parcel unmailable, provided the contents of the sealed receptacles are plainly visible or are unmistakably indicated by the method of packing or by a precise statement on the covers. But such sealed receptacles will not be admitted to the parcel post unless enclosed in an outside cover open to inspection."

Interior Preparation and Protection.—The first essential in preparing merchandise for shipment by parcel post is that the contents of the whole parcel, whether in one or several packages, be individually wrapped in good waterproof paper and adequately tied with twine fastened by loop knots, permitting ease in opening if required. The interior packages ought not to be sealed, at least not until after presentation at the post office. Soft articles of a yielding nature, such as hosiery or clothing, should be folded to make a uniform package, tied with twine after being compressed and then wrapped with a waterproof paper, which is similarly tied, the twine running at least once around the smallest dimensions of the parcel and at least twice around the larger dimensions.

The second important thing in the preparation of the interior contents of a parcel is that the contents fit very snugly and tightly. The package should be rigid. Any play that is permitted increases the danger of damage to the goods and of breakage of the exterior container. The contents themselves should be made rigid and the outside container should fit exactly, or, if any stuffing is required it should make the contents tight and absolutely prevent any shaking about in the container, while at the same time it must be light in weight, whether it is excelsior, paper wadding, or what-not, although it is clear that the effort to save twelve cents in postage by eliminating weight in package may sometimes cause a loss from damage of many times that amount.

The preparation of merchandise for parcel post shipment sometimes involves careful consideration of import duties in the country of destination, as has been suggested in regard to regular freight shipments. Thus, in Latin American countries where goods pay duty on legal weight, the immediate packing around the articles themselves may frequently be omitted with advantage. Thus, prominent exporters of jewelry call attention to the fact that in a number of Latin American countries jewelry should not be shipped attached to cards or packed in display trays or boxes. Small tags may be used in place of cards and the jewelry may be wrapped in tissue paper for the immediate wrapper. The cards commonly employed in the United States are rarely used by retailers in the countries in question. If boxes or trays are shipped they may either be forwarded separately or, in some cases, the net weights of the jewelry itself and of the boxes or trays may be declared separately.

The following statement from the Official Postal Guide gives definite instructions as to certain forms of interior packages: "It is permissible to accept liquids, dyes, greasy substances, and similar articles inclosed in lead-sealed metal containers for those foreign countries admitting such articles in the parcel post mails, provided the containers are labeled in printing so as to show the

nature of the contents, the quantity, and the name of the manufacturer or dealer, and, in addition, such containers are inclosed in substantial outside covers open to inspection.

"With respect to compression or friction top metal cans or containers, it should be suggested to manufacturers and dealers that these compression and friction top metal cans or containers be lead sealed or soldered in at least four places, so as to render them acceptable for mailing, as indicated in the paragraph above, and thus insure the lids from being forced out of place in the course of transit. It is preferred, however, that inside containers be used that will permit closing by screw top covers with sufficient screw threads to require at least one and one-half complete turns before the covers will come off, such covers, when employed, to be provided with washers, so as to prevent possible leakage of the contents."

The Outside Container.—Official instructions to postmasters provide that "parcels packed in thin, flimsy paper or packed in thin pasteboard boxes will not be accepted." Further than this there are no official regulations of a general nature but numerous hints of great importance will be found in the "Observations" which appear in the Official Postal Guide under the different foreign countries to which parcel post mails are dispatched. For example, under the heading of Egypt, we find the following:

"Parcels for the Sudan must be packed in wood, tin, canvas, linen, or similar material, and not merely in brown paper or cardboard, and be securely sealed with wax or lead, preferably lead. Parcels not packed in wooden or metal boxes must be covered with canvas, linen, or similar material sewn up at the flaps and folds and secured with string sealed at the knots and ends. Wooden boxes must be of stout material, well screwed or nailed together at the sides, top, and bottom. Light and bulky articles must be packed in strong wooden cases. Parcels containing bacon, ham, honey, cheese, cakes, puddings, fish, olives, butter, or other substances likely to cause damage by exuding, must, in addition to the outer packing described above, be inclosed in hermetically sealed tins or surrounded with some absorbent material, such as sawdust."

Under instructions applying to parcel post for Russia, the Guide observes: "Parcels must be packed in wood, tin, canvas, linen, or similar material, and not merely in paper or cardboard, and be securely sealed with wax or lead, preferably lead. Parcels not packed in wooden or metal boxes must be covered with canvas, linen or oilcloth (not linen faced paper) sewn up at the flaps and folds, and secured with string sealed at the ends and knots. Wooden boxes must be of stout material, well screwed or nailed together at the sides, top and bottom. To avoid delay at the Russian frontier, senders are strongly advised to tie all parcels round with cord, sealing the loose ends with lead seals." In regard to these special regulations it should be noted that the sealing, sewing, nailing, etc., which are advised, must be done after presentation of the parcel at the mailing office.

The Canadian Post Office Department not long ago issued the following: "Ordinary brown paper wrapping and ordinary cardboard boxes, such as shoe boxes, are not sufficient, nor should thin wooden boxes be used. Strong paper cardboard or strawboard boxes are recommended, especially those of corrugated cardboard with laps which completely close the sides also. Strong wooden boxes, tin boxes such as are used for packing biscuits, and several folds of stout wrapping paper may suffice, according to the size and nature of the goods."

In a recent statement to the present writer, the Second Assistant Postmaster General strongly deprecated the use of thin wooden boxes in parcel post shipments. "The acceptance should be discouraged, of pasteboard boxes, parcels wrapped in paper of less than a reasonable degree of thickness or of reasonable tensile strength, packages tied with weak twine, and unstrapped wooden boxes made of material less than one-half inch thick."

A well-known New York export house writes in regard to parcel post shipments that there should always be a final outer covering of cloth material of some sort which will show quickly if any pilfering has taken place. This exporter strongly favors oilcloth covers.

Wood and Tin Containers.—In many instances, the use of wooden or tin outside containers is strongly to be recommended, yet, whenever possible, precautions should be taken that any such containers should be so prepared that the corners and edges will not be likely to damage other parcels with which they may come in contact in the mail bags, remembering the constant and long continued friction to which the contents of these bags are subjected. Wooden boxes should be stout and strong, yet of the minimum weight possible according to the contents. Light woods, such as bass or white pine, are recommended. The American Red Cross in its instructions for the preparation of overseas parcels advises that ends of wooden boxes be not less than ⅜ inch thick, and sides and bottom 5/16 inch thickness as a minimum, all wood to be dressed on both sides. Cement coated nails should be used when boxes are closed by nails, the three-penny size being advised.

Special regulations apply to shipment of articles made of celluloid when they are dispatched to a number of foreign countries and probably should apply in the case of all shipments of such articles. In general, the regulations provide that celluloid or articles made of celluloid, must be packed in strong wooden boxes and the parcel itself must be labeled celluloid in large plain black letters.

Fibre and Straw Board Containers.—The very definite and precise instructions issued by the Interstate Commerce Commission for the construction of fibre and strawboard containers, may very well be taken as a model for such containers, when applied to shipments of parcel post packages overseas, even though the original instructions were designed to apply solely to domestic shipments of inflammable liquids. These specifications are, it is true, very exacting, but, as has been repeatedly

emphasized in these pages, too much thought and care cannot be devoted to the problem of delivering merchandise in safe and sound condition into the hands of our customers in other countries. Here follow extracts from the regulations referred to which may be found in full, with further details, in the official publications of the Interstate Commerce Commission.

"The inside containers must be securely closed in such manner as to prevent leakage of the liquid during transit.

"Each inside container must be wrapped separately in single-faced corrugated strawboard wrappers. If the inside containers exceed ½ pint capacity each, they must also be separated by double-faced corrugated strawboard partitions or packed separately in double-faced corrugated strawboard cartons or boxes; provided, that containers of not more than one ounce capacity each, packed in wooden boxes or double-faced strawboard cartons and cushioned when necessary to prevent breakage, may be packed in outside cases without the wrappers or partitions prescribed above.

"Fibre board or pulpboard used in making fibre board or pulpboard cases must be 3-ply or more, all plies firmly glued together, the outer ply waterproofed, and no single ply less than 0.02 inch in thickness. Solid fibre millboard used in making cases must be composed of not less than 50 per cent of sulphite fibre and must be waterproofed throughout.

"When the glued ply fibre board or pulpboard used in making cases is not less than 0.10 inch in thickness, having a resistance of not less than 275 pounds to the square inch, Mullen test, and an inner mantle of glued ply fibre board or pulpboard is arranged and constructed to closely fit inside the case, this mantle having a resistance of not less than 175 pounds to the square inch, Mullen test, the combined capacity of all containers in the case must not exceed 6 quarts.

"The mantle shall be made in one piece of glued ply fibre board or pulpboard or double-faced corrugated

strawboard, and shall be accurately fitted to the inside of the container with a close-fitting edge but arranged longitudinally along the center of one of the sides (not heads) of the cases. This flush edge butt to be located approximately midway between the top and bottom edges of said side of case.

"When the solid fibre millboard, composed of not less than 50 per cent sulphite fibre used in making cases is not less than 0.08 inch in thickness, having a resistance of not less than 320 pounds to the square inch, Mullen test, the combined capacity of all containers in the case must not exceed six quarts; provided, however, that the two ends shall consist of scored and flanged solid fibre millboard not less than 0.08 inch in thickness, having a resistance of not less than 320 pounds to the square inch, Mullen test, and each of these heads or ends shall be reënforced by a straight, unflanged piece of solid fibre board of the same thickness and strength of the heads or ends. The reënforcing board shall be secured to the case ends by metal stitching around the edges and through the center, spaced not more than 3 inches apart.

"All cases constructed of solid fibre millboard which is composed of not less than 50 per cent sulphite fibre, that contain more than a total of 6 quarts, shall have placed transversely in the center of their length a diaphragm or division with scored and flanged connection to the sides, top and bottom of said case. This intermediate transverse diaphragm shall be composed of solid fibre millboard not less than 0.08 inch in thickness, having a resistance of not less than 320 pounds to the square inch, Mullen test.

"The heads of all glued ply fibre board or pulpboard cases must be formed of four laps of length within ⅜ inch of short dimension of head. When the short dimension of head is greater than one-half of the long dimension, one of the short dimension laps must be cut at center of case, and one of the long dimension laps must be scored in the center to bend over the shortened lap.

"Cases constructed of glued ply fibre board or pulpboard or of solid fibre millboard composed of not less than 50 per cent sulphite fibre must be creased, not cut, to produce a reënforcing fillet on the inner side of fold. This requirement will apply alike to flanged ends and flanged intermediate transverse diaphragms as well as to the side members.

"The side lap of glued ply fibre board or pulpboard cases must be at least 1½ inches wide, double stitched, or glued and stitched, with flat wire not less than ⅛ inch wide and of suitable thickness, with stitches spaced not more than 2½ inches apart. Machine used must be capable of driving the wire through the fibre board so that the stitching, when completed, will be perfect.

"Cases constructed of solid fibre board composed of not less than 50 per cent sulphite fibre where the total contents do not exceed 6 quarts shall have the side lap not less than 1 inch wide, single stitched with flat wire not less than ⅛ inch wide and of suitable thickness, with stitches spaced not more than 1½ inches apart. Machine used must be capable of driving the wire through the solid fibre millboard so that the stitching, when completed, will be perfect. The heads of all glued ply fibre board or pulpboard cases must be closed with animal glue coated on the entire contact surfaces.

"Cases constructed of solid fibre millboard composed of not less than 50 per cent sulphite fibre must have heads flanged out, both flanges being stitched to the case, sides, top, and bottom, with flat wire not less than ⅛ inch wide and of suitable thickness spaced not more than 1½ inches apart. The width of flanges on heads and diaphragms must be not less than 1 inch, including fillet.

"Rivets, if equal or superior in strength to the wire stitching, may be used.

"Double-faced corrugated strawboard used in making double-faced strawboard cases, must be of corrugated strawboard, with inner and outer facings of fibre board or pulpboard, both facings having proper bending qualities, firmly glued to the corrugated sheet, with the outer facings waterproofed.

"When the outer facing of the double-faced corrugated strawboard is not less than 0.018 inch in thickness, having a resistance of not less than 85 pounds to the square inch, Mullen test, and the inner facing is not less than 0.018 inch in thickness, having a resistance of not less than 85 pounds to the square inch, Mullen test, the combined board having a resistance of not less than 200 pounds to the square inch, Mullen test, and an inner mantle of double-faced corrugated strawboard is arranged and constructed to closely fit inside the case, this mantle having a resistance of not less than 175 pounds to the square inch, Mullen test, the combined capacity of all containers in the case must not exceed 6 quarts.

"The mantle shall be made in one piece of double-faced corrugated strawboard, and shall be accurately fitted to the inside of the container, with a close fitting edge butt arranged longitudinally along the center of one of the sides (not heads) of the case. This flush edge butt to be located approximately midway between the top and bottom edges of said side of case.

"Each double-faced corrugated strawboard case shall be made out of one piece of material. The edge connection of the side to the end must be close fitting and be secured by a single cloth or sealing strip not less than 2 inches in width and having a resistance of not less than 120 pounds to the square inch, Mullen test, extending the entire length of the seam and secured by animal glue to the box. Double cloth sealing strips may be used if the inner strip is made not less than 1½ inches wide and the outer strip not less than 2½ inches wide, each cloth having a resistance of not less than 60 pounds to the square inch, Mullen test, each thickness extending the entire length of the seam, the inner being firmly glued to the case, and the outer being efficiently and firmly glued to the inner cloth and to the case.

"The heads of all double-faced corrugated strawboard cases containing a total of not more than 4 quarts, must be formed with four flaps, each pair of flaps butting at approximately the center line of the head. Cases

containing a total of more than 4 quarts, but not more than 6 quarts, must have the two inner flaps butt at the center line of the head and the two outer flaps each cover the entire head. Cases containing a total of more than 6 quarts, but not more than 8 quarts, must have both inner and outer flaps cover the entire area of the head; provided that cases containing a total of more than 4 quarts, but not more than 8 quarts, may consist of two complete double-faced corrugated strawboard cases, one closely fitted inside the other, the inner case made of double-faced corrugated strawboard having a resistance of not less than 175 pounds to the square inch, Mullen test, and the outer case made of double-faced corrugated strawboard having a resistance of not less than 200 pounds to the square inch, Mullen test, fully complying with these requirements and specifications, and with the heads of each case formed with four flaps, each pair of flaps butting at the center line of the head.

"Heads must be closed with animal glue coated on the entire contact surface.

"A corrugated strawboard case of the triple slide telescope type is approved for the transportation of inflammable liquids in quantity not exceeding 4 quarts in one outside container and must be constructed as follows:

"Each case shall be of the triple slide telescope type, each slide being made of one piece material with seams and closing edges secured by single cloth sealing strips not less than 2 inches in width, and having a resistance of not less than 120 pounds to the square inch, Mullen test, extending the entire length of the seam, and secured by animal glue to the box. Double cloth sealing strips may be used if the inner strip is made not less than 1½ inches wide and the outer strip not less than 2½ inches wide, each cloth having a resistance of not less than 60 pounds to the square inch, Mullen test, each thickness extending the entire length of the seam, the inner being firmly glued to the case and the outer being efficiently and permanently glued to the inner cloth and to the case.

"The double-faced corrugated strawboard used must have both facings not less than 0.016 inch in thickness having a resistance of not less than 75 pounds to the square inch, Mullen test, the combined board having a resistance of not less than 175 pounds to the square inch, Mullen test. Both facings must have proper bending quality and be firmly glued to the corrugated sheet. The outer facing must be waterproofed."

Boxes of fibre board, pulp board, solid mill board and corrugated strawboard, may not only be of the described one piece construction but may be of two piece or three piece construction, provided the material used together with the use of an inside lining or mantle conforms to the specifications above given as to strength and thickness. Construction may be of any of the usually accepted methods, but the joints must be made by tape, stitching and gluing as provided above.

Bags.—Possibly the materials most commonly shipped by parcel post in bags are those in powder form and the great desideratum therefore is to prevent the sifting of the contents. The cloth, of whatever nature, must be closely woven, of a strength not less than 200 pounds to the square inch, Mullen test.

The largest manufacturer in the United States of photographic goods states that cameras by parcel post are always packed in heavy double strawboard boxes wrapped in strong waterproof bags.

Bundles in the Parcel Post.—If contents of a parcel post bundle are such as not necessarily to require a stiff outside container, they may be forwarded in a package wrapped either with burlap, Osnaburg, sheeting, a combination of paper and cloth, two or more thicknesses of heavy waterproof kraft paper weighing not less than what is known as No. 60 or duplex waterproof wrapping paper strengthened with either cords or wire, if the instructions of the American Red Cross are to be followed. Whatever the wrapping material may be it should have a resistance of at least 120 pounds per square inch, Mullen test. The outside cover should be folded

twice before closing at the top and have the ends folded down and across, the pointed end so formed being folded over and then up and tightly tied with twine fastened with a loop knot. A New York concern doing a large mail order business by parcel post states that it always uses boxes made of fibre board, wrapped in a cloth lined tarred coating material weighing 70 to 80 pounds per ream, which it is almost impossible to tear.

Liquids and Semi-Liquids in the Mails.—The United States regulations provide that liquids, oil, paste, salves and other articles easily liquefiable, are admitted to the parcel post mails of many countries (for exceptions see Official Postal Guide), provided they are packed in accordance with the regulations prescribed for the admission of such substances to the United States parcel post mails. More detailed and specific instructions applying to foreign parcel post mails are those issued by the Belgian government which have been translated as follows:

"Liquids, oils, greases, and other articles easily liquefiable must fulfill the following conditions:

"If they are in strong glass bottles containing 4 ounces (113.40 gr.) or less, the total quantity sent in a package can not exceed 24 ounces (680.39 gr.), liquid measure. Each bottle must be wrapped in paper or some absorbent substance, and then the whole placed in a cardboard box, or in a box of similar material, and packed in a receptacle or cardboard of good quality corrugated on both sides. The corners of the receptacle must be hermetically closed and tied with string in a manner to prevent leakage of the liquids in case the container is broken, and the entire package must be wrapped in strong paper and tied with string. Bottles containing a maximum of 4 ounces of liquid (113.40 gr.) may be packed as outlined in the next two paragraphs.

"In the case of glass bottles holding more than 4 ounces (113.40 gr.) the total quantity sent in a package must not exceed 16 ounces (453.69 gr.) liquid measure. The bottles must be very solid and inclosed in a block or

tube of metal, wood, cardboard, or some material; and between the bottle and the tube or the block must be placed a certain quantity of cotton felt, or some other absorbent material. The block or tube, if it be of wood or cardboard, must have a thickness of at least 3 millimeters for bottles holding 8 ounces (226.80 gr.) at the most, and of at least 5 millimeters for bottles holding more than 8 ounces. The block or tube must be rendered waterproof by the application, on the inside, of paraffin or of some other suitable substance, and must be closed with a stopper so threaded that it will be necessary to give it at least a turn and a half in order to remove it. The cover must be provided with a washer, so that the liquid can not escape, should the bottle be broken. A number of bottles separately packed according to the foregoing instructions can be put in one package, provided the maximum weight and dimensions prescribed by these rules are not exceeded.

"Bottles containing liquids can also be packed in solid receptacles well closed with wood, metal, or waterproof corrugated cardboard.. A space must be left around the bottles and filled with bran, sawdust, or any other absorbent material in a sufficient quantity to absorb all the liquid should the bottle be broken.

"When the liquid is in a metal receptacle, the receptacle must be suitably sealed and put in a box."

Watches by Parcel Post.—Packages of watches shipped by parcel post would seem to be particularly subject to danger from pilfering, especially as the post office must be able readily to inspect the contents and in consequence the packages are usually sent unsealed. A large manufacturer of watches believes that his astonishingly small loss by pilfering is due to no small extent to the fact that his packages are relatively inconspicuous. If the packages were clustered with red wax the loss would doubtless be much greater. Watches shipped by parcel post are packed in standard containers made for the purpose of heavy corrugated paper in the manner of folding boxes. One large shipper writes: "Our watches

Courtesy of Waltham Watch Co.

WATCH CASES FOR PARCEL POST SHIPMENT.

Watches are first packed in individual boxes which are placed in cartons. Cartons are wrapped in heavy, high-grade oil cloth, and then in heavy wrapping paper.

Courtesy of Victor Talking Machine Co.

PHONOGRAPH RECORDS PACKED FOR PARCEL POST SHIPMENT.

Photograph shows a single record in envelope, the required number of records in waxed paper, an empty fibre board container and container corded and marked for shipment.

are first placed in individual boxes so wrapped with tissue paper that there is no play in the box, or they lie in a nest in the box which prevents the watch from banging against the side of the box. The individual boxes are then placed in cartons holding 12 each, and the cartons are wrapped in corrugated paper around which is placed a tar lined paper which is impervious to moisture, and then there is a final layer of plain paper tied with heavy twine."

Another large watch manufacturer states in reference to shipments of watches by parcel post: "Our watch movements and cased watches are packed as follows: The movements in tin containers and the cased watches in cardboard containers, packed so many to a package, depending upon the size of the watches, the average package weighing not more than 11 pounds. Of course, four to five pounds of this amount are included in the weight of the packing material of the container. The merchandise is solidly and safely packed with a wadding of tissue paper, the tissue paper being laid in the bottom of the box, the merchandise laid on that, further tissue paper carefully wadded on all sizes so that the merchandise is entirely surrounded by a wadding of tissue paper. This package, in turn, is wrapped in heavy quality high grade oilcloth in such a manner that water will not enter the cracks, and carefully tied with string, and this package again packed in high grade heavy quality wrapping paper and tied with the best quality of heavy hemp cord. All packages are shipped unsealed."

Hats by Parcel Post.—A large exporter of hats writes: "During the war and even up to the present time, on account of irregular freight sailings and high freight rates, most of our shipments have gone forward by parcel post. In packing for parcel post the packages must, of course, conform in weight and size with the regulations of the postal law. We have used various methods of packing for parcel post but the one we are now using and which we think gives the best results is as follows:

"The round pasteboard carton containing six hats

is placed in a square corrugated carton and this is placed in another corrugated carton, and then wrapped in heavy wrapping paper and securely tied with strong twine.

"In shipping to Venezuela, where the difficulties of transportation are very great, we ship in oilcloth bags. In this instance, the hats are not packed in round cartons but instead a dozen or more hats are nested together and placed in the bag which is then sewed and sealed. In some instances we have shipped to Venezuela in tin cans but this method is too expensive."

Fountain Pens by Parcel Post.—Perhaps the largest exporter of fountain pens states that where single pens are shipped, the pen is packed in the box in which it is regularly sold in this country and then enclosed in a strong cardboard export box, wrapped in waterproof paper and strongly tied with cord. Shipments of quantities of pens at a time are packed in tough cardboard boxes especially prepared of high grade material with strong resistance. The inside packages included within the outside container are of special character, already described in this chapter as "outlook boxes," all of which are sealed and each one bears the inscription, "Please count before breaking seal. This box contains..... pens, packed by....., examined by....., caps attached regular....., sterling....., gold filled....."

Talking Machine Records.—Disk records for talking machines are frequently forwarded by foreign parcel post. Usually records are packed singly in envelopes and the required number of enveloped records wrapped in waxed paper, the entire shipment being so divided that no single complete box will weigh more than 11 pounds. The packing of one of the most important manufacturers in this line is well illustrated in the accompanying photograph (see page 707). This company explains that the fibre board container is constructed of 100 point fibre board with an average resistance of 285 pounds to the square inch, "Mullen Test." The outside liner is of waterproof material. The box is reënforced with a piece of strong linen tape which is glued to the outside, thus

taking much of the strain that occurs at the corners should the box be dropped. There are four flaps, top and bottom, each pair meeting completely at the center of the box. The bottom flaps are glued, the top must be left open for postal inspection.

The flaps of this box are tied down with a good quality of jute twine. The markings are put on with stencil and marking ink and are afterward sprayed with a fixative to prevent smearing or rubbing. In addition to the protection afforded by the top and bottom flaps, pieces of double faced corrugated board are used between the package of records and the box. Any space remaining is filled completely with these corrugated boards.

The Combination Package.—The Advisory Committee on International Parcel Post defines the combination package as a "package which consists of two parts firmly attached together, both parts bearing the same address, one part being a sealed envelope containing the communication, fully prepaid at the letter rate of postage; the other being an unsealed package containing samples of merchandise or printed matter fully prepaid at the appropriate rate of postage." All of which means that it is possible to send together a catalog and a letter referring thereto, or a lot of samples and a corresponding letter, so that letter and package will reach destination at the same time. The letter only pays first class rates. These combination packages may be sent at present to some fifteen countries.

The combination package may be in the form of an envelope with a binding piece for the letter, or in the form of a combined sack and envelope, and obviates the old and costly method of sending catalogs and samples first class in order to assure their arrival at the same time as a letter referring to them. This matter should be fully investigated by exporters.

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